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**In the Field of Invention**

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**Review of Books**



**Trade Enquiries**

NTHLY MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

L. XLII. CALCUTTA, APRIL, 1951.

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WIRE FENCING

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**INDUSTRY.**

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**EDITORIAL CONTENTS FOR APRIL, 1951**



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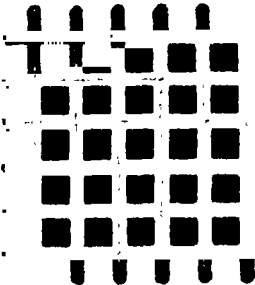
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EDITOR :

N. BANERJEE.

VOL. XLII. CALCUTTA, APRIL, 1951. No. 493.

# "SOLID RESULTS."

THE Indian Budget for 1951-52 presents an overall picture of the economic conditions which can by no means be called hopeful.

It is distressing to note that notwithstanding the plethora of plannings covering almost all spheres of economic activities and frequent exhortations to the men in the street to be practically-minded and engaged in solid work, the general economic conditions in the country do not register any improvement ; on the other hand they are actually causing "considerable anxiety," as stated in the Budget speech of the Finance Minister.

If this deterioration is causing "considerable anxiety" to the Government, it is causing much more auxiety to the people who are going without food and cloth and have to deny for long years the very amenities of life which stand for higher "standard of living" for which it is stated the Government is striving for. Neither do they know when they will be relieved of the heavy taxations under which they are groaning.

Inescapable conclusion from all this is that there are some defects in working out the plans. It is time that proper enquiries be instituted about the progress of the various plans in operation for which the Government is spending lots of money. Lately an enquiry was made by the Reserve Bank of India about the progress of the Grow-more-food campaign in Bombay, which had been in operation for the last eight to nine years. The investigations revealed that "the achievements of the campaign did not appear to be commensurate with the resources expended on it," and that "the campaign was often directed with more attention to publicity and glamour than to solid results." The total failure of the Jute Campaign, as lately disclosed in a press communique, should also set us athinking if we have the right type of men at the helm of affairs who instead of merely devoting themselves to publicity work in the press will act in a way that will lead to "solid results." The recent revelations about the scheme for pre-fabricated houses, fertiliser factory, etc. should be stern eye-openers to the Government. It is time that the Government set about their business in a practical way and instead of allowing matters to drift in an aimless way give a correct lead by carefully re-examining the schemes and leave them in charge of those who are capable of showing "solid results."

# —CURRENT TOPIC

**WORLD TOBACCO CONGRESS**

A World Tobacco Congress will be held at Amsterdam from the 17th to 24th September, 1951, under the auspices of the Netherlands Ministries of Economic Affairs and of Agriculture, Fisheries and Food of the Government of the Netherlands. The Congress intends covering the entire field of cultivation, science, commerce and fabrication of tobacco, in order to co-ordinate the work of the agencies which are interested in this field.

Attached to the Congress, an exhibition will be held for the display of raw tobacco and its production, excepting tabocco manufactures. It is hoped that as many parties as possible will avail of the opportunity for displaying their products to a large gathering of world tobacco interests. Particulars may be had of the Director of Exhibitions, Ministry of Commerce and Industry, Administrative Intelligence Room, Queensway, New Delhi.

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**TRADE ARRANGEMENTS BETWEEN INDIA AND SPAIN**

Trade arrangements have been arrived at between the Governments of India and Spain as a result of discussions held in October 1950. The arrangements will continue in force up to September 30, 1951.

The Spanish Government have agreed to grant licences for the import of green or black tea from India up to a value of pound 4,000. The other main Indian goods of interest to Spain are: hides and skins, dyeing and tanning substances, kapok, shellac, manganese ore, chrome ore, carborundum and corindon, linseed,

Indian Government have agreed import from Spain fluorspar and lithop There are a large number of other c modities available in Spain which can imported into India under the exis import control regulation. Some of th are: potassium chloride, tartaric acid, c manufacturers, drugs and medici saffron, almonds, glass sheets and pla implements and tools, electric motors permissible type, electric meters, leat tanning and curing machinery, pow driven pumps, saw mills and wood wc ing machinery, olive oil, knitting machi textile machinery of permissible type cotton, jute and wool, shuttles, lead ( and wrought), quick silver, cigar paper, umbrella cloth, ferro-alloys, l bearings above 1" bore diameter and ro bearings, abrasives, pneumatic air cc pressors, railway accessories, firewo for ship, electrical appliances (permiss type) and permissible chemicals.

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**QUALITY OF SUGAR MANUFACTURED INDIA**

A remarkable feature of the prod tion of sugar in India for the season 19 50 is that the quality of sugar manuf tured shown a welcome improvement m the production of I.S.S. No. 29, the hi est colour grade, shows marked incre from about 1.97 per cent in the last s son to 9.19 per cent this season. Prod tion of I. S. S. No. 28 also has been nea twice that of the last year, the rise be from 26.41 to 49.13 per cent. I. S. S. this year covers the highest product and marks a significant improvem inasmuch as I. S. S. 27 accounted for highest production during the past seasons.

Production of I. S. S. No. 26, has go

8 this year: production under other ver grades have likewise decreased. e bulk of production is represented by ee colour grades, viz., I. S. S. Nos. 29, and 27, which account for 96.05 per it of the total production. A signifi- it improvement of the year is that the crease in production of I. S. S. colour ides Nos. 27, 26 and 25 has been wholly orbed by the increase in production of higher I. S. S. colour grades Nos. 28 d 29, which marks a definite progress vards production of better qualities of jar in respect of colour. Production of jar in different I. S. S. grain sizes con- ues to be more or less similar to that of last year.

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**NTRAL BUILDING RESEARCH INSTITUTE**

The Seventh National Laboratory of lia viz., the Central Building Research titute, started functioning last Febru- at Roorkee, Uttar Pradesh. The ns of research which the Central Ins- te will undertake include, among ers, (a) problems of heating, lighting l ventilation of building; (b) proper- of materials used in building such as ient, plaster, bricks, etc.: and (c) icture and strength of materials. It will s undertake examination of buildings common use and methods of applying m with a view to effecting improvement erever practicable, undertake scienti- diagnosis of the causes and defects of ures in materials themselves or in their lication, and prepare standards of mate- s and codes of practice for various ects of building construction.

The Institute, it is understood, will ry on its research work in collabora- i with the building industry in general. activities naturally include basic re- rch and fundamental studies coming hin its purview, such as X-ray studies l differential thermal analysis of clays and their electro-chemical and rheological properties, strains and stresses in structures, and comfort in buildings. It will be assisted in its work by an Advisory Council, representing different interests, and by standing and ad hoc scientific and technical committees, consisting of specialists in different subjects. It is to be hoped that the Institute will also consider the problem of planning and building houses for the low income groups and the refugees.

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**DRUG RESEARCH INSTITUTE**

The progress of research in drugs and medicines in our country has been, sporadic, unorganised, and haphazard. In view of this, and also prompted by the imperative need for ensuring collaborative effort among the various groups of scientists engaged in drug research, the Pharmaceutical and Drugs Committee of the Council of Scientific and Industrial Research emphasised, as early as in 1947, the importance of intensive research on drugs and chemicals forming an integral part of any comprehensive health plan for India, and recommended the establishment of a Central Research Institute. It is in pursuance of this recommendation that the Government of India decided, some time ago, to set up the Central Drug Research Institute at Lucknow as one of the eleven National Scientific Laboratories. The opening of this Institute in February by India's Prime Minister thus marks a very significant event in the history of Indian drug research.

The Institute's main functions are:— (1) promotion of drug research generally; (2) testing and standardisation of drugs discovered there and providing expert advice on further development and production; (3) providing facilities and advice to such scientists, universities and

institutions, industries and others as are not in position to carry out complete investigations in matters relating to drugs; (4) organising controlled clinical trials of drugs in hospitals and clinics; and (5) dissemination of scientific knowledge relating to drugs. The Institute will have several divisions, including chemistry, biochemistry, pharmacology, microbiology and parasitology, clinical science, and botany, besides an animal house for testing the effect of various drugs on animals.

The prevalance of epidemic and endemic diseases, such as malaria, small-pox, cholera, plague, typhoid and typhus fever, should set the scientific workers connected with the Institute athinking if new drugs and medicines can be made and rendered available to the common man at as cheap a price as possible. This will be helpful to the industry and serviceable humanity.

**GARDEN COLONIES**

Low yield of different fruit trees is an important problem of our country. The yield of most of the fruit varieties is not even 50 p.c. of that obtained in some of the advanced countries. The Agriculture Department, Punjab (I), in view of the vital importance of this problem has been collecting leading varieties of all fruits and selecting the competent ones after thorough comparative trials for producing of desired pedigree. The Department has also been supplying genuine plants to the public at prices much below those charged by private nurseries. For this purpose, a Central nursery is maintained at Jullundur with subsidiary branches at Gurdaspur, Attari, Palampur, Abohar, Hansi, Sirsa, Karnal, Panipat and important fruit growing areas of the State. The idea is to make available nursery plants of approved types at the very door of the growers and thus minimise the cost of transportation and the chances of mortality in transit. It is also proposed to extend the work of supply of reliable nursery plants.

**FRUIT INDUSTRY IN PUNJAB (I)**

In order to revive the fruit industry in Punjab (I) the Government have reserved an area of 21,030 acres in 2[illegible] compact blocks in the state for the establishment of fruit orchards. Mostly displaced persons have been allotted land in these colonies in blocks of 20 and 1[illegible] acres. This is the first experiment of its kind in co-operative gardening in the whole of Asia, with great potentialities for the future.

**INDUSTRIAL PRODUCTION**

The year 1950, was a period of prosperity" for all major industries, excepting cotton textile and jute industries, which were handicapped by the shortage of raw materials due to trade deadlock with Pakistan. Statistics regarding the leading national industries showed that cotton textiles last year reached the lowest ebb since partition. The textile industry's output in 1950 was 3,667 million yards of cloth, a decline of 237 million yards from the previous year. The jute industry India's major dollar earner, also touched a low ebb in 1950 with the production of jute goods totalling 836,000 tons as against 946,000 tons in 1949. Production in other major industries, e.g., steel, coal cement, salt and electrical goods registered substantial increases. Steel production increased to about 980,000 tons last year The previous year's production was 920,000 tons. Cement production went up to 2,600,000 tons last year as against 2,100

000 tons in 1949. During 1950, 32 million tons of coal were mined an increase of 5% over the previous year. The country's entire requirements of softcoke and brick-burning coke were met from Indian collieries. Over 70,700,000 manuds of salt were produced in 1950 as against 55,600,000 manuds in 1949. India's salt production is adequate for her needs and may even leave a margin for exports, in the opinion of salt dealers.

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**LOCOMOTIVE MANUFACTURE IN INDIA**

It may be recalled that a Technical Aid Agreement was signed about a year ago between the Indian Railway Administration and the Locomotive Manufacturers' Association of Great Britain. Under the agreement, any locomotive which India may require over and above her indigenous production will be supplied by the Association subject to the price and delivery being satisfactory to the Ministry of Railways. In 1950 three locomotives were built at Chittaranjan with parts manufactured abroad. The 1951 target is 33 locomotives with 33% of the parts built in the Works. It will produce 45 locomotives in 1952 with 72% parts manufactured at Chittaranjan, while in 1953 the target will be 60 locomotives, 80% of the parts of which will be built in India. Complete production of 90 locomotives has been planned for 1954.

Under the Agreement technicians are also being supplied by the Association for the Works. There are now six full-time British consultants on loan. In addition, the Works is periodically visited by a chief technical consultant one of whom is now in India. The first batch of about 10 Indian technicians is now in England on training with member firms of the Association.

**TISSUE MILL IN INDIA**

It was felt that India being a chi[...] source of hemp and seed flax, which a[...] the main raw materials, for the manufa[...]ture of tissue paper for cigarette makir[...] should be an ideal home for its manufa[...]ture but the supplies of tissue from abroa[...] being adequate, no project for its produ[...]tion was then conceived. It was n[...] until the late war that supplies from man[...] parts of the world ceased and the prov[...]sion of tissue paper for the cigarett[...] industry in this country became in a[...] senses of the word a burning questio[...] In 1942 cigarette manufacturers decide[...] to ensure their source of supply by manu[...]facturing in this country. A small pil[...] installation, which cost only Rs. 10,00,0[...] was set up a Raniganj. It was capab[...] of producing from 30 to 40 tons of tiss[...] paper a month, and came into productic[...] in 1943. It was the success of this pla[...] that decided the promoters to go ahea[...] with the far larger project of making tiss[...] paper on a commercial scale at Triben[...] The Mill has been designed to produce 24[...] tons of finished tissue a month. This [...] a small amount in terms of normal pap[...] manufacture, but it is of considerab[...] importance in terms of cigarettes. Th[...] output each month on this basis is suff[...]cient to wrap five and a half thousan[...] million cigarettes. That is, 250,000 mil[...] of cigarettes placed end to end or 5,0[...] miles of cigarettes packed in tins of 5[...] Less than half this quantity will at th[...] present moment be required for cigarett[...] production in India. One hundred an[...] forty tons per month will be available f[...] export to West Africa, Israel, Sout[...] America, Central America, China, Au[...]tralia and New Zealand. The foreig[...] currency accruing to India as a result [...] these exports will amount to approxima[...]tely Rs. 1,00,000 per year.

**FIXATION OF MINIMUM WAGES**

The question of fixation of minimum wages for industrial labour as envisaged in the Central Minimum Wages Act of 1948 was referred to the National Planning Commission. The Commission thinks that the time is not opportune for such a step, especially because of unsettled conditions in most Indian industries resulting mainly from international developments. It is thought that the fixation of minimum wages will invariably lead to increased production costs, and will adversely affect the country's economy in addition to worsening the competitive position of Indian industries in the world market. Considering the Indian Government's financial and administrative limitations, the Commission has also suggested that the statutory fixation of minimum wages for agricultural labour be left to the discretion of States.

Accepting the Commission's suggestions, the Government has decided to amend the Act during the current session of Parliament. The Amending Bill will seek to extent the time limit for fixing the minimum ages for industrial labour by another year from March, 1951. The original time limit was March, 1950.

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**ATOMIC ENERGY MINERALS**

Geological Survey by Atomic Energy Commission has revealed rich and extensive deposits of Atomic Energy Minerals in parts of Travancore, Madras, Bihar, Rajasthan, and Ajmer. Two Uranium belts also rich in Thorium and Lithium have been discovered, one, 50 miles long in East India and another running towards North West from about Central India.

Of the universally recognized Atomic Energy metals, Uranium, Thorium and Beryllium, India is richest in Thorium deposits. A Factory at Alwaye, in Travancore, is to be set up for separation of Uranium and Thorium from Monazite sands. The Union Government and the Travancore State Government are jointly setting up a Factory for processing Monazite sands for the production of rare earths, Uranium etc,. A French firm is setting up the plant offering the necessary technical assistance and undertaking processing until such time as the Indian personnel being trained by the firm, in France, are in a position to assume charge of processing. Another Factory is to be set up for production of Uranium and Thorium Compounds from out of the Uranium ores as also Uranium and Thorium bearing residues obtained from the Rare Earth Factory at Alwaye. This factory is expected to be self-supporting by sale of Thorium compounds to indigenous Gas-Mantle Industry.

Atomic Energy Commission has offered to buy all stocks of Uranium ore at prices based on their Uranium contents. As a further incentive rewards are offered for discovery of new deposits and grants-in-aid for mine developments.

Lithium bearing mineral deposits have also been recently discovered. The metal is found to be very important in the production of Super-bombs. India is one of the few countries possessing large quantities of this rare metal.

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## —INDIAN SOIL & CROPS

THE enormous extent of the territory of India and its vast population are now causing the State a good deal of difficulties to feed the people. Since the chief wealth of an agricultural country extensive methods of cultivation is the soil, from the crop of which live both the peasant and the State itself.

The soil of India is intrinsically rich, and suited to the particular crops sown thereon. The land of the country has been under the plough for countless centuries but has shown no signs of exhaustion. It still continues to yield fairly large quantities of the crops shown thereon. The yield per unit is comparatively lower in this country than in some more advanced and scientifically better developed countries, employing superior technique and providing appropriate aids to keep the soil perennially rich. But that is due rather to ignorance and economic factors, than to any inherent defects of the soil.

### AREA CULTIVATED UNDER VARIOUS CROPS

The gross area cultivated with crops covered 253,198,000 (India proper) plus 77,309,000 (in Indian States) acres in 1942-43. The different classes of crops and the area occupied by each class are stated in the table below. Of the total sown area food crops occupied about 267,708,000 acres or 82 per cent and money crops 44,796,000 acres plus 1",003. or 18 per cent. Of the food-crops, food-grains (cereals and pulses) covered as much as 197,923,000 plus 56-156,000 acres or 78 per cent of the total area sown and other food crops (condiments and spices, sugar, fruits and vegetables, and miscellaneous food-crops together) some 10,479,000 plus 3,150,000 acres or 4 per cent of the total. Of the money crops, fibres (such as cotton jute, hemp, etc.) occupied 15,994,000 plus 6118 acres and oil-seeds 15,110,000 plus 7817 acres, or 6 per cent of the total area sown in each case. The other non-food crops—dyes and tanning materials, drugs and narcotics (tobacco, tea, coffee, opium, etc.), fodder crops, and miscellaneous non-food crops together occupied about 13,692,000 acres or 6 per cent of the total. This will be evident from following table:—

| | Area In India Proper | Area in States |
|---|---|---|
| | ( Thousand | Acres. ) |
| Food grains ...... .. | 197,923 | 56,156 |
| Condiments and Spices . . | 1,430 | 982 |
| Sugar . ... | 3,588 | 301 |
| Fruits & Vegetables . . | 4,126 | 1,223 |
| Miscellaneous Food Crops | 1,335 | 644 |
| Total Food Crops . | 208,402 | 59,306 |
| Oil-seeds . . .... | 15,110 | 7,817 |
| Fibres . .. | 15,994 | 6,118 |
| Dyes & Tanning Materials | 80 | 4 |
| Drugs and Narcotics ...... | 2,114 | 536 |
| Fodder Crops . | 10,607 | 2,511 |
| Miscellaneous non-Food Crops ..... ... | 891 | 1,017 |
| Total Non-Food Crops . . | 44,796 | 18,003 |

In the development of agriculture, however, the first and foremost consideration is the study soil, to find out its suitability of cultivation of a particular type of crop. Then classify the soil according to this system. Of course, one type of soil may be conserved with other type by judicious application of manure.

In this article it is proposed to discuss the different varieties of Indian soils, their capacity of food production and their development to meet the ever-increasing demands for the production of

#### SOILS AND ITS FORMATION

Soil may be defined as a heterogeneous collection of rock and mineral fragments whose decomposition and disintegration have been brought about by the action of physical, chemical and biological forces, working singly or in combination. From the view point of the agriculturist, the main function of the soil is the support of plant growth, hence the above definition must include that a soil must contain sufficient decomposeable plant remains to serve as a source of energy in stimulating the action of these forces to produce plant food in an amount sufficient to support the growth of plants commonly used in agricultural pursuits.

As our present soils are a result of actions that have continued throughout all the ages, it is evident that they would differ markedly in their characteristics. The kind of rock, or rocks, from which they have been formed, and the time, manner, and place of their formation together with certain features that they now possess, present definite factors that can be correlated, and thus serve as a basis for a definite classification.

#### PHYSICAL CLASSIFICATION OF SOIL

The soils may be classified into sedentary and transported. Transported soils are again subdivided into Alluvial and Diluvial. Alluvial soil consists of fragments or particles of minerals arranged according to their size and are very fertile. Diluvial soil consists of soil proper mixed up with stones and boulders, brought down by rain from hills.

Soils are also classed as Light and Heavy, Warm and Cold, Moist and Dry. They are also classified according to the crops which do best on them, or which ought to be grown on them for economical reasons. Richest soils are called garden to their prevailing physical constitu These are, stone, gravel, grit, sand, calcium carbonate, vegetable matter moisture. Soils are thus divided stony, gravelly, gritty. sandy, cl calcareous, peaty and marshy. The however no hard and fast distinction ween one group and the next. Sand be against siliceous, or micaceous felspathic, that is either containing a of plant-food or none at all. Stones pebbles are not immediately useful plant-life but they serve a useful pur in retaining moisture and acting a reserve of plant-food. Stony soils th fore though usually poor are not necessarily, and some stony soils, those which contain chiefly fossils, l stones, basaltic stones and felspars, rich.

#### MECHANICAL ANALYSIS

The mechanical analysis of soil done by sifting and washing. Si separates the coarser particles and w ing the finer particles. The sample of to be analysed is to be spread on the of a dry and warm room; lumps are t broken up and crushed as drying proce The large stones are then to be pi out, cleaned, dried and weighed. dry soil is then to be passed throug sieve the meshes of which are 3 mm diameter. That which passes throug weighed as fine earth, and what rem on the sieve as gravel. The grave further washed and dried and weig again as true gravel. The fine eartl then boiled for an hour to break lumps, and it is then put into a wasl apparatus (e.g., Schulz's apparatus, which by introducing a flow of wate different rates, first the finest suspen matter is washed away and then succe

Another process of mechanical analy- ɔf soils consists in arranging a series ressels side by side and allowing the ɛr from the one to flow into the next. ; also divides the soil into portions of :rent consistency. For either process ; necessary finally to let the water ɔorate completely from each vessel and reight the dry residue. This analysis ɔles us to separate the soil into (1) es; (2) mechanical gravel; (3) coarse l; (4) fine sand; (5) finest sand, and clay and impalpable matter. Clay- proper is that which contains only and impalpable matter. Soils which the physical property of clay may ain no clay in the chemical sense, i.e., :ate of aluminium. The composition hemically pure clay may be represen- by the formula $Al_2O_3 2SiO_2 2H_2O$.

A more rough and ready method of hanical analysis consists in taking an :e of soil, mixing it up with a pint of ɛr, leaving it in the water for 24 hours, shaking it up and allowing the heavi- articles to settle for 5 minutes. The :rnatant liquid can then be poured in- nother vessel which may be allowed :and for another 24 hours. The sandy will be seen settled in one vessel and clayey part in the other. These may lried and weighed separately.

:f 100 grains of dry soil, not peaty or sually rich in vegetable matter, leave more than 10 of clay treated in this ner, it is called sandy soil; if from 10 0 sandy loam; if from 40 to 70 a loamy If from 70 to 85, a clay loam; from o 95, a strong clay soil; and when no l is separated at all by this process, a pure agricultural clay. Pure clay ains silica and alumina in the propor- of about 60 of the former to 40 of the :r, but the composition of agricultural however, that arable land should contain more than 30 to 35 per cent. of alumina. Soil containing more than 5% of carbo- nate of lime is called marl, and more than 20%, calcareous soil. Peaty soils contain more than 5% of humus or vegetable mould. Ferruginous soils contain over 5% of iron.

### CHEMICAL CLASSIFICATION

In chemically classifying the soil we must consider the chemical composition of plants and then classify according to chemical requirements of plants. We know that plants derive the bulk of their food from the air and from water. The largest proportion of a plant consists either of carbon or of water. The carbon portion of a plant also varies very much, but it usually comes next in importance to water. The carbon is fixed in plants with the help of sun light acting on chlorophyll granules, out of the carbon dioxide of the air. So the carbon of plants is derived without any trouble on the part of the cultivator. The nitrogen of plants is partly derived from the atmos- phere by rain but it is mainly obtained from the soil and manures applied to it. The presence of ammonia and nitrates in the soil is therefore of great importance. In fact, the amount of nitrogen present in the soil mainly determines its value. There are other constituents of plants, which are essential, though usually occuring in minute proportions. For these minor essentials plants have to depend entirely on soil.

On burning a plant, its carbon, water, and nitrogen pass away and only ash is left behind, which on analysis is found to contain the following:—Phosphoric acid, sulphuric acid, potash, lime, magnesia and iron in the form of oxides. Soda, silica and chlorine are also nearly always

*these food constituents. Alumina is only sometimes found.*

According to the chemical requirements of plants, soils can be divided into: (1) Aqueous or boggy soils; (2) Nitrogenous soils; (3) Phosphatic soils; (4) Potassic soils; (5) Calcareous soils; (6) Ferruginous soils; (7) Siliceous soils; (8) Alkali soils (containing an abundance of CaO, MgO, NaO and $K_2O$); and (9) then sulphurous soils. Water is of the highest value, then nitrogen, then phosphorus, then potash, then lime, then sulphur, then iron and lastly silica, chlorine and soda. The physical importance of Silica or Sand, as making the soil freer and lighter to work and for roots to penetrate, is very great, but not its chemical importance. The chemical importance of the soluble silicates in soils is, however, very great. The importance of Chlorine and Soda (i.e., of common salt) for certain crops such as coconut, mangoes, beet (not sugarbeet), onions, carrots, radishes, potatoes, cabbages, cotton, cashew-nuts, date, breadfruit tree, asparagus, is undoubted, but the presence of these is not essential in the soil for every crop.

Potassium salts can replace sodium salts in some plants, and the presence of potassium salt is therefore doubly important. The absence of any of the essential constituents of plants, as mentioned above, makes a soil quite sterile. But in rare cases it is met with a type of soil wanting altogether in moisture, or nitrogen, or phosphoric acid, or potash, or lime, or magnesia, or iron, or sulphuric acid.

Plants generally grow in any soil which contains a sufficient proportion of these. The presence of an excess of certain salts or of some substances poisonous to plants may render the soil sterile in spite of the contains all the essential constituent the growth of vegetation, and even well-water or drainage-water percol through soils contains all the esse constituents for the growth of vegeta so much so, that water-culture with well or drainage-water alone has successful with reference to a good n plants including oats. It is from solu that plants can absorb food. The so lity is helped by the organic acids and carbon-dioxide excreted by the root Soil digested in water ought to part 1 part of solid for every 1,000 part water for plants to make proper use o solid. If over 2 parts of solid are diss ed in 1,000 parts of water, the roo cannot make proper use of the food, n less than .5 part in 1,000 parts. A can be too rich in soluble plant-food too poor, as the solubility is required t in a certain dilution. A soil becomes too if in the dry season it is manured with f urine which contains nearly 2 p.c. of u a substance which can be directly use plants as food. But a 2 per cent. solu even of a valuable plant-food is at l 10 times too rich. This accounts Bengal cultivators regarding urine as jurious to crops, though it is really n valuable in the fresh state than cowd Diluted with ten times as much w urine proves a most excellent fertilize soils. As nearly all soils contain all c tituents of plant-food, the chem classification of soils is based not absolute but only on relative grounds

### TYPES OF INDIAN SOIL

There are four main varieties of s in India, namely:—

(a) The red soils derived from r of the Archaan system. These are fo chiefly in Madras, Mysore and the So

to Orissa, Chota Nagpur, and the h of Bengal.

(b) The black cotton or Regur soils ch overlie the Deccan trap and cover greater part of Bombay, Berar, the estern parts of Madhya Pradesh Hyderabad with extension into Cen- India and Bundelkhand. In Madras se soils are less common but still portant.

(c) The alluvial soil of Indo-Gange- Plain and the Plains of the Indus alley. They are the most important il variety from the point of view of ricultural productivity yielding probab- the largest quantity of food stuffs. hese include Sind, Northern Rajasthan, unjab, Utter Pradesh, Bihar and half of ssam.

(d) The laterite soils forming a belt und the peninsular and extending into ast Pakistan, Assam and thence to irma.

Besides these four main categories, ere are other soils in India, such as the sert soils of Rajasthan or Eastern parts West Pakisthan, which are not so rich yield or extensive in area. Rajasthan d Southern Punjab have other varieties alkali soils, which go under various mes in the different Provinces. These ils have a high degree of impermeability d stickiness together with heavy alkali- y and frequent presence of excess of e salts. These soils are usually poor nitrogen and so are unsuitable for crop ising without previous reclamation.

Forest soils make yet another category, d occupy large tracks of the country. ie soil profiles in Chaubatta Hill and of Kulu Forests belong to the Brown rth anid Bordsol variety.

**DIFFERENT SPECIES OF CROPS**

After classifying the soils both ysically and chemically let us classify the soils with reference to the crops. This kind of classifiatcion has the merit of being easily applicable in practice to ordinary farming, as it does not depend on elaborate chemical analysis but only on such rough and ready methods of analysis as an intelligent and educated farmer can easily command.

To determine the class of any soil the following direction should be followed:—

(1) Take 100 grains of a well-pulverized soil after drying it for half an hour in an air or oil-bath at 250°F. Heat it in a platinum crucible for half an hour. stirring the mass occasionally. Cool it in a dessicator and weigh. The loss of weight is calculated as Humus.

(2) Digest the residue in the platinum crucible in a phial with cold diluted Hydrochloric acid in proportion of ½ ounce of acid to 10 ounces of water to 100 grains of dry soil. Let the digesting go on for half an hour with occasional stirring. Filter through a weighed filter-paper, wash until the water passing through ceases to give acid reaction tested with litmus paper. Dry the whole at 250°F.; weigh the substance in the filter paper; deduct the weight of the filter-paper. The loss of weight represents the amount of lime.

(3) The contents of the filter paper are now carefully removed into a tall glass cylinder, and the impalpable matter is separated from the sand and coarser particles by repeated washing with water. Stir well, let it subside for a minute and then pour on the supernatant liquid. The impalpable matter thus separated is collected on a filter, dried as before and weighed. The weight represents the weight of clay.

(4) The remainder is sand.

From the above method of classification we may mention here the type of

crops, which will grow on a particular soil.

### ARGILLACEOUS OR CLAYEY SOILS

Argillaceous or clayey soils, which contain above 50 per cent clay and do not contain more than 5 per cent lime commonly called paddy land are suitable for the cultivation of sugar cane, paddy, wheat, arahar, gram, peas, beans, moong, linseed, and cabbages. The calcareous kinds of soils which are not too rich in clay and not too poor in sand and humus, give good returns. And those, which are poor in humus, are still suited for oats.

### LOAMY SOILS

These soils contain not more than 50 not less than 30 per cent of clay and do not contain more than 5 per cent of lime. These are known as vegetable land. The most appropriate types of crops grow in this class of land are wheat, barley, grain, jowar, cotton, arahar, maize, beans, cauliflowers.

### SANDY LOAMS

These kind of soils contain not more than 30 per cent not less than 20 per cent of clay. They do not contain more than 5 per cent of lime. These soils are suitable for the cultivation of bajra, kalai, aus paddy, barley with gram, jowar, mustard with wheat, and other rabi crops, potatoes and turnips. Other root crops also thrive well in these soils.

### LOAMY SANDS

Loamy sands contain not more than 20 not less than 10 per cent of clay and contain less than 5 per cent of lime. These are suitable for growing kalai, mustard, sorguja, cucurbitaceous vegetables (melon, gourd, etc.), barley if rich in humus, and jowar.

### SANDY SOILS

In sandy soils not more than 10 p.c. of clay is present. They do not contain more than 5 per cent of lime. These are ca millet land and are best suited for c vating the following: Bajra with sorguja, kalal or moong, also barley v value and often cultivated only ev third year and the poor lands are cu vated at all. Those soils contain humus and lime are chiefly fit for bu wheat, oats, hemp, tobacco, potat millets and maize.

### MARLY SOILS

Marly soils contain more than 5 cent but less than 20 per cent of li The argillaceous types containing ab 50 per cent clay, and 5 to 20 per c lime are commonly called paddy a arahar lands. They are suited for pad arahar, wheat, khasari, and moosur. T loamy types are containing 30 to 50 clay and 5 to 20 p.c. lime suitable wheat, potatoes, barley, and pulses. T sandy types are best suited to barley, oa gram and maize. The types of ma soils belonging to loamy sand are sui for oats, jowar, pulses and bajra. T marly soils which contain above 5 cent humus, 20 to 50 or more of clay a 5 to 20 p.c. of lime, are suitable for cor The humus and argillaceous marly so are amongst the best that exist.

### CALCAREOUS SOILS

The calcareous soils contain mo than 20 per cent of lime and are kno to cultivators as pulse lands. The arg laceous soils often approach in value the argillaceous marls; the remaini orders of both these classes equally co respond one with the other; to the mo valuable belongs, as in the case of mar soils, the humus. Those wanting in h mus require much manure. Those rich clay are well suited for wheat. Oats a lucerne thrive in them. Their value much decreased by containing an exce

of lime. It makes soils both hungry and thirsty, i.e., they need heavy manuring and irrigation, unless there is humus in them, over 5 per cent. But oats and most pulses and lucerne will do on such soils.

### HUMUS SOILS

Humus soils are known as lands for oil seeds and vegetable. The value of these soils is greatly augmented by admixture with lime. Those which contain lime and clay are suited for wheat, barley, melons, gourd, and oleagenous plants; the loamy and sandy humus soils are specially adapted for oats, and in most places for wheat. The peaty and acid humus may be made fruitful by admixture with lime, sand and clay.

### EFFECTS OF SUNLIGHT, RAIN, ETC

Effects of different coloured rays of the sun on vegetation are important factors bearing on farming. A short discussion on this subject will give an idea to the would be farmers.

Solar rays are composed of seven colours. The different colours are known to produce different effects on vegetation. The following extract from Mr. N. G. Mukherjee's Handbook of Agriculture will show the effects of different colours such as ruby, brown-red, orange, yellow, cobalt-blue and deep green. "The young plants first broke the soil in the box covered with the orange glass, and last under those covered by yellow, green and blue glasses. It was subsequently found that the effect of the yellow rays was such as to prevent the germination of the seed, even although the rays only rested on the surface of the soil while the seed lay buried beneath; while, again, the blue light seemed to remarkably favour the process. Under the orange light the plants grew vary tall, but then they had white stalks, and they refused to put forth any flowers. Under the yellow light it was remarkable that a numbier of little fungi or mou sprang up and flourished luxuriar while the plants themselves withered a died. Under the red light the plants o grew an inch or two high, had someth of a reddish colour, and soon rotted a perished, although supplied with abu ance of food in the soil in which tl were placed. Under the green light plants grew slowly but tolerably stro yet none would flower, notwithstandi the greatest care and attention paid them. The results under the blue gl were very different. The seed germin ed a little less quickly than in the op air, but the plants became compact a healthy in their character, putting fo their flower-buds strongly and floweri in perfection. Under this light alone the various processes go on with tl vigour which is characteristic of vegetati in the open air. It is inferred that su would also probably be the case w plants grown under violet glass."

### RAIN-FALL

The amount and distribution of rai fall which a particular locality receiv usually determine its productiveness, e pecially in the tropics. In the Malab coast of India and in parts of Assam t largest quantity of rainfall occurs, a these are the most productive tracts India. The regions of heavy rainfall, i. of 70 to 100 inches or more, are Assa parts of Eastern Bengal, the Cis-Himal yan region of Northern Bengal and tl Eastern and Western Ghats.

The effect of rain fall slowly but sure in changing the physical character of tl surface soil, where such soil lies bare is overgrown only by short grass, must n be ignored. The finer lighter, which is a advantage only for soils which are to stiff. High winds, however, bring ba some amount of fine dust and tend to kee

up a balance. High winds which prevail on the seaside districts are therefore not to be regarded as absolutely inimical to agricultural pursuits. In course of time they help to make sandy tracts loamy and fit for cultivation. On the whole, however, boisterous winds are not helpful to the proper growth of crops unless they are very short crops. An occasional gale may lay low and spoil a crop nearly ready for the sickle and where high winds are the rule, very few crops can be grown and the landscape is generally found quite bare of trees in such localities, and how helpful trees are to agriculture in various ways, we will see later on.

What proportion of rain evaporates, what proportion sinks into the soil and feeds wells and springs, and what proportion finds its way by means of drains, streams and rivers, into the sea, depend upon the climate of the place, the season of the year, the porosity of the soil, the nature of the strata below, and the contour of the whole district or locality.

The rainfall of India is becoming more and more capricious, and this is to be attributed to the establishment of factories in regions where there is no coal, and where, in consequence, trees are getting cut down in millions every year. There are about 1,200 factories in the Bombay Presidency, using daily about 200 manuds of fuel each. What an enormous destruction of trees this must imply. The effect of trees in equalising temperature and the distribution of rain, and in entrapping rain, is universally recognised. A law should be passed in this country insisting on the planting and maintenance of a tree for every one cut down, whether in forests or in cultivated areas.

Untimely rainfall may sometimes occur. Such heavy rainfall could be at

and Western India, and in those parts where little rain is obtained. January rains should be always utilized in getting lands under the plough after rice harvest. Once brought under the plough, the land can be afterwards kept stirred from time to time until the next rice sowing or transplanting season. This results in the soil absorbing fertility from the air and in being free from insect and fungus pests. If rains occur again in February after land has been prepared, sowing of catch-crops, or crops which take only about three months getting ready, should proceed vigorously. Such crops as have a beneficial effect on the future rice crop should be chosen in preference; so that if the crops come ultimately to nothing, the land at least may be fertilized. Melons and other cucurbitaceous crops, maize, juar, til, bajra, marua, buckwheat, cotton, cowpea, ground-nut, dhaincha, sunn-hemp, jowar sim or arharia sim (Cyamopsis psoralioides) can be grown as catch-crops with untimely but heavy rain. The last five crops should be preferred as they have an excellent action in fertilizing the soil. When untimely but heavy rains occur in any month usually there is heavy rain again the month after, at least that is our experience in Lower Bengal; so that there should be no hesitation on the part of cultivators to utilize heavy rains whenever they may happen. It is also our experience in Bengal, that heavy rains early in the season are compensated by short rainfall late in the season, and short rainfall early in the season is compensated by heavy rainfall late in the season. Cultivators make a great mistake to consult almanacs and Brahmin soothsayers in cultivating land and sowing seed. They ought to follow their own experience and common sense in the matter.

FERTILITY OF SOIL

soil is the first codition of any permanent system of agriculture. In the ordinary processes of crop production fertility is steadily lost: its continuous restoration by means of manuring and soil management is therefore imperative.

Fertility is covered by the minimum of necessary ingredient. A soil may be rich in all essential ash constituents of plants but dificient or wanting only in one, and this deficiency or want may result in its barrenness. Soils derived from several rocks are better than soils from one rock, as there is no likelihood for such soils being deficient in any necessary constituent.

A fertile soil should contain all the essential ash-constituents of plants in a sufficient quantity and in an available form. But these cannot be readily ascertained.

A ten-plot or five-plot experiment is a practical guide for ascertaining their presence. A still readier method of judging the fertility of soil is the ascertaining of the following facts: 1st. Do earth-worms and grubs of insects abound to a sufficient depth in the soil? 2nd. Do plants of various natural orders, including the leguminose, grow abundantly and luxuriantly on the soil? 3rd. Are the bones of animals habitually living on the soil, large-sized? 4th. Do shells of snails, etc., abound in the soil? A soil which is helpful to the growth of wild vegetation and which is able to support wild animal-life in abundance and build the solid parts of their body which are rich in phosphoric acid and lime, must be rich soil. The greater the absorbent co-efficient of a soil, the greater is its fertility; and the large the proportion of the decomposable silicates present in them, the more fertile they are.

The greater the proportion of a soil which is dissolved by dilute acids, the more fertile it is. The amount of soil-substances soluble in water usually varies from .2 to .5 per cent. But solubility in pure water is not a guide to the solubility of plant-food actually undergoing in the soil. Some chemists, e.g., Hermann von Liebig, assumed that dilute Acetic acid dissolved all those substances available to plants; but the acid secretions from rootlets are of a complex nature, and no absolute guide as to the dilution to be used is possible. Professor Stutzer of Bonn was the first to use 1 per cent solution of Citric acid for ascertaining the amount of available phosphoric acid in manures, and Dr. Dyer of London has carried out this method in dealing with soils, and arrived at very important practical results, in determining the proportions of available phosphoric acid and potash in soils. But the method gives no clue to the amount of available nitrogen in soils; and after all the question of fertility is mainly concerned with the amount of available nitrogen present in the soil. Besides, acid secretions from all rootlets are not all equivalent to a 1 per cent solution of Citric acid. Some secretions are more acid than others, and some plants therefore, are better able to utilize the latent fertility of soils than other. The average acidity of root-secretions in terms of Citric acid, shown by hundreds of plants examined by Dr. Dyer, is not 1 but about 0.86 per cent. Coming to individual plants he found the variation was very great. Strawberry showed about 2 per cent and a geum (another plant of the order Rosaceae) as much as 5.53 per cent; while the examination of Solanaceae and Liliaceae gave very low results. about 0.36 per cent. Cruciferae and leguminose averaged about 1% while Gramineae, Umbelliferae, Compositae and Chenopo-

diaceae showed only about ½%. These results, however, are very important in showing how some orders of plants, such as Rasaceae, Cruciferae and Leguminosae thrive on poor soils, while others such as Solaneae, Liliaceae, Gramineae, Umbelliferae, Compositae and Chenopodiaceae, need liberal manuring. Some plants of the same natural orders differed widely from others in this property of acidity of root-secretions and the figures should be judged according to this reservation.

### BARRENNESS OF SOILS

Barrenness of soils may be produced by the presence of excess of ferrous salts formed by the oxidation of iron pyrites in the soils. Lands newly reclaimed from the sea contains ferrous salts and are therefore temporarily barren. Soils mix with tank-earth are barren for the time being. Ferrous sulphate is soluble in water but ferrous salts combined with organic matter are soluble in hydrochloric acid. Soils which are too acid may therefore become barren when there are organic ferrous salts present. Drainage, lining and cultivation and exposure to the action of sun and air are the means of reclaiming lands containing these poisons.

More than 2 per cent of soluble salts in a soil makes it barren; but a very much less proportion of sodium chloride (common salt) would make a soil barren. Lands to be reclaimed from these saline soils have to be drained of their excess of salt before they become fit for cultivation. The barren lands of the West Pakistan and Uttar Pradesh usually contain an excess of sodium carbonate or sodium sulphate which are locally called Reh. These lands art being reclaimed by drainage, enclosure and light manuring. Once a series of experiments were conducted to ascertain the proportions of different sodium salts which might be present in a soil without preventing plant growth. In the Handbook of Agricultur[e] by N. G. Mukherjee it is mentioned tha[t] to good garden soil, which was see[n] to contain no appreciable amount of an[y] of the sodium salts, were added definit[e] amounts of the three salts, sodium carbonate, sodium sulphate and sodium chloride. The amounts of salts varied from .1 to 1%. Cereals and pulses were sown in separat[e] pots. It was found that each of thes[e] salts retarted the germination. The cereals were affected by 7% of carbonate o[r] sulphate and by .4% of chloride. Th[e] germination of the pulses was retarded b[y] smaller amounts, i.e., by .2 to .4% of Carbonate or Chloride and .7% of Sulphate. In the after-growth .2% of the carbonat[e] did harm, whilst .4% was quite fatal. U[p] to .2% of Sodium Chloride was foun[d] harmless in a few cases, whilst .1% proved harmful in others. Sodium sulphate was less harmful, perfect growt[h] both in the kharif and rabi seasons bein[g] maintained in the presence of .5% of th[e] salt. As in germination so in the after growth, the leguminose were affecte[d] more than the cereals by the excess o[f] soda salts. From this experiment it ma[y] be inferred how the lands reclaimed i[n] Sunderbuns though they become fit fo[r] growing rice very readily, are found unsuitable for pulse-crops for a long time. In the presence of lime, however, som[e] leguminous crops such as lucerne an[d] dhaincha can stand more common sal[t] than they otherwise do, and in seasid[e] places where there is no doubt of th[e] presence of limestones, lucerne an[d] dhaincha can be readily grown.

Another cause of the barrenness o[f] usar lands is their impermeability to water. Gypsum has been used with success i[n] correcting this.

Waters from mines containing alu-minium and magnesium salts in excess

ten prove poisonous to plants, also waters containing copper, lead and other heavy metals, in solution.

### IMPROVEMENT OF SOILS

In its natural condition the soil is possessed of certain existing and obvious qualities, and of certain other dormant capabilities. How are the existing qualities to be improved and the dormant capabilities to be awakened.

It follows from the above that soils may be arranged into two broad classes, namely:—

(1) Those which contain in themselves an abundant supply of all these things which plants require, and are therefore fitted chemically to grow any crop.

(2) Those which are deficient in some of those elements on which plants live, and are therefore not fitted to grow any one crop with luxuriance.

Both these two classes of soils are susceptible to improvement the former by mechanical methods chiefly, the latter by mechanical partly, but chiefly by chemical methods of improving the soils the first step to be taken is to drain the improvable lands. The advantages that result from draining are manifold. The presence of too much water in the soil keeps it constantly cold, and thus the plants never experience for their growth that genial warmth from sun's rays, which is expended in evaporating the water. Where too much water is present in the soil, also that portion of the food of the plant which the soil supplies is so much diluted, that either a much greater quantity of fluid must be taken in by the roots or the plants will be scantily nourished. In consequence the stem and leaves keep down their temperature and so the chemical changes, on which its growth depends.

By the removal of the water, the physical properties of the soil are in a remarkable degree improved. The soil becomes open, friable, and mellow more easily worked, and pervious to the air in every direction. The access of this air is essential to the fertility of the soil, and to the healthy growth of most of our cultivated crops. The insertion of drains not only makes room for the air to enter by removing the water, but actually compels the air to penetrate into the under parts of the soil, and renews it at every successive fall of rain.

Vegetable matter becomes of double value in a soil thus dried and filled with atmospheric air. When drenched with water, this vegetable matter either decomposes very slowly, or produces acid compounds more or less unwholesome to the plant, and even exerts injurious chemical reactions upon the earthy and saline constituents of the soil. In the presence of air, on the contrary, this vegetable matter decomposes rapidly, produces carbonic acid in large quantity, as well as other compounds on which the plant can live, and even renders the inorganic constituents of the soil more fitted to enter the roots, and thus to supply more rapidly what the several parts of the plant require. Hence, on dry land, manures containing organic matter (farmyard manure, etc.) go further, or are more profitable to the farmer. Draining also exerts a very important influence on the changes going on in the soil, whereby the nitrogen is prepared for the plant's use. In a waterlogged soil not only is the process of nitrification checked, but a reverse process goes on, whereby the nitrates already present are deoxidised and a portion of the nitrogen is set free, and escapes in the form of gas.

Nor is it only stiff and clayey soils to which draining can with

advantage be applied. It will be obvious to every one, that when springs rise to the surface in sandy soils, a drain must be made to carry off the water; it will also readily occur, that where a sandy soil rests upon a hard or clayey bottom, drains may likewise be necessary; but it not unfrequently supposed, that where the subsoil is sand or gravel, thorough draining can seldom be required.

It is not less common, even in rich and fertile districts, to see crops of beans, or oats, or barley, come up strong and healthy, and shoot up even to the time of flowering, and then begin to drop and wither, till at last they more or less completely die away. So it is rare in many places to see a second year's clover crop come up strong and healthy. These facts indicate, in general, the presence of noxious matters in the subsoil, which are reached by the roots at an advanced stage of their growth, but into which they cannot penetrate without injury to the plant. The drain calls in the aid of the rains of heaven to wash away these noxious substances from the soil, and of the air to change their nature; and this is the most likely, as well as the cheapest, means by which these evils can be prevented.

The economical advantages of draining in such soils as we posses are chiefly these?—

(1) Stiff soils are more easily and more cheaply worked.

(2) Lime and manures have more effect, and go further.

(3) Seed-time and harvest are earlier and more sure.

(4) Larger-crops are reaped, and of better quality.

(5) Nutritive grasses spring up where inferior grasses formerly grew.

(6) Valuable crops of wheat and turnips are made to grow where scanty crops of oats were formerly the chief return.

(7) Naked fallows are rendered less necessary, and more profitable rotations can be introduced.

(8) The climate is improved, and rendered not only more suited to the growth of crops, but more favourable to the health of man and other animals.

(9) The soil is actually enriched by what the rains bring down.

(10) Air is sucked down into the subsoil.

(11) Certain processes whereby plant food is being prepared in the soil are promoted, such as nitrification.

After the land has been laid dry by drains, other mechanical modes of improvement can be employed with advantage. Even the ordinary methods of mechanical culture become more useful, and the benefits which in favourable circumstances are derived from turning up the soil are greater and more manifest. This is effected in a variety of ways. For one thing, by opening up a soil the action of the frost is rendered more powerful, and the disintegration of the soil goes on more rapidly. The soil is thus rendered more porous, and the roots of the plant are permitted to develop more quickly under such conditions. We have already pointed out that the soil can absorb from the air the minute quantities of ammonia present in it. The more the soil is tilled, the more freely will its particles be brought into contact with the air, and the more abundant will the absorption of the ammonia become. These facts will appear by a brief consideration of the effects produced by ploughing to various depths, and the causes from which they arise.

The subsoil-plough is an auxiliary to ıe drain—it stirs and opens the under soil ·ithout mixing it with the upper or im- ıediately active soil. Though there are :w subsoils through which the water will ot at length make its way, yet there are ɔme so stiff, either naturally or from long ɔnsolidation, that the good effect of a 'ell-arranged line of drains is lessened y the slowness with which they allow the ıperfluous water to pass through them. ı such cases, the use of the subsoil-plo- gh is most advantageous in loosening ıe under layers of soil, and in allowing ıe water to find a ready escape down- 'ards to either side, until it reaches the :ains.

After the land is provided with drains e subsoil being very retentive, the sub- ıil-plough is used to open it up—to let ıt the water and let in the air. If this not done, the stiff under-clay will con- act and bake as it dries, but it will ·ither sufficiently admit the air, nor open ı free a passage for the roots. Let this ɔeration, however, be performed when e clay is still too wet, a good effect will llow in the first instance: but after a hile the cut clay will again cohere, and e farmer will pronounce subsoiling to ·'a useless expense on his land. Defer e use of the subsoil-plough till the clay dry, it will then tear and break instead cutting it, and its openness will remain. nce give the air free access, and, after time, it so modifies the drained clay that no longer has an equal tendency to here.

#### DEEP PLOUGHING

Deep ploughing, like subsoiling, aids e effect of the drains, and so far where goes nearly as deep—even more com- etely effects the same object. Deep oughing is no longer regarded with such favour as was at one time the case. The best soil is at the top, and that the micro-organic life which exercises such an important function in promoting the process of plant-growth is chiefly to be found in the surface portion, and cannot develop freely in the deeper soil-layers. It is true that certain substances, such as lime, when applied to the soil, have a tendency to sink down, and that deep ploughing serves to bring them to the surface. Subsoiling, combined with moderate ploughing, is the best treatment for heavy soils.

#### IMPROVEMENT OF SOILS BY MIXING

It has been already shown that the physical properties of the soil have an important influence upon its average fertility. The admixture of pure sand with clay soils produces an alteration which is often beneficial, and which is almost wholly physical. The sand opens the pores of the clay, and makes it more permeable to the air.

The admixture of clay with sandy or peaty soils, however, produces both a physical and a chemical alteration. The clay not only consolidates and gives body to the sand or peat, but it also mixes with them certain earthy and saline substances, useful or necessary to the plant, which neither the sand nor peat might originally contain in sufficient abundance. It thus alters its chemical composition, and fits it for nourishing new races of plants.

Such is the case also with admixtures of marl, of shell-sand, and of lime. They slightly consolidate the sands and open the clays, and thus improve the mechanical texture of both kinds of soil; but their main operation is chemical; and the almost universal benefit they produce depends mainly upon the new chemical element they introduce into the soil. •

IMPROVEMENT BY AGENCY OF VEGETATION

There are certain modes of improving the soil, which, though involving only simple operations on the part of the improver, produce their effects through the agency of refined scientific causes. Such are the improvements produced by planting and laying down to grass.

Lands which are unfit for arable culture, and which yield only a trifling rent as natural pasture, are yet in many cases capable of growing profitable plantations, and of being greatly increased in permanent value by the prolonged growth of wood. Not only, however, do all trees not thrive alike on the same soil,, but all do not improve the soil on which they grow in an equal degree.

The main cause of this improvement is to be found in the nature of the soil, which gradually accumulates beneath the trees by the shedding of their leaves. The shelter from the sun and rain which the foliage affords prevents the vegetable matter which falls from being so speedily decomposed, or from being so much washed away, and thus permits it to collect in larger quantities in a given time than where no such cover exists. The more complete the shelter, therefore, the more rapid will the accumulation of soil be, in so far as it depends upon this cause.

The improvement of the land, therefore, by the planting of trees, depends in part upon the quantity of organic food which the trees can extract from the air, afterwards drop in the form of leaves upon the soil, and in part upon the kind and quantity of inorganic matter which the roots can bring up from beneath, and in like manner strew upon the surface. The quantity and quality of the latter will, in a great measure, determine the kind of grasses which will spring up, and the consequent value of the pasture in th feeding of stock.

(1) It causes vegetable matter to ac cumulate on the surface; and, (2) brings up from beneath certain substance which are of vital importance to th growth of plants, but in which the uppe soil may have been deficient.

IMPROVEMENT BY THE APPLICATION O LIME

The use of lime is of the greatest im portance in practical agriculture. It ha been employed in the forms of marl, shell shell-sand, coral, chalk, limestone, lime stone gravel, quicklime, etc. in almos every country, and from the most remot period. Many of the older views respect ing the nature of the action of lime ar exploded. We now see that its action i in most cases more or less indirect. It i probably seldom that a soil lacks th necessary amount of lime required as a plant food for the crops that grow upon it Its chief action is in ameliorating th mechanical properties of the soil, and in setting free other plant foods such as potash, etc. The fact that it is very des tructive on the organic matters of the soi is another consideration which shoulc render us very cautious in applying i indiscriminately. Instead of applying lime, in many cases, it is found bettei policy to apply artificial manures. Grea though the benefits of lime undoubtedly are, it will be best to apply it chiefly to soils whose mechanical conditions are such as will greatly be improved by it, to new land where it is simply indispensable, and to soils extremely rich in peat and organic matter. Its use, on the other hand, to land in a high state of cultivation except in very small quantities, is not to be recommended as a rule.

The quantity of quicklime laid on at

ch it may be repeated, depend upon kind of land, upon the depth of the , upon the quantity and kind of vegele matter which the soil contains, and on the species of culture to which it is jected. If the land be wet, or badly ined, a larger application is necessary produce the same effect, and it must more frequently repeated. But when e soil is thin, a smaller addition will oroughly impregnate the whole, than here the plough usually descends to the epth of 8 or 10 inches. On old pasturends, where the tender grasses live in 2 r 3 inches of soil only, a feeble dressing ore frequently repeated, appears to be he more reasonable practice; though in eclaiming and in laying down land to rass, a heavy first liming is often indisensable.

The most remarkable visible alterations produced by lime are,—upon pasturs, a greater fineness, sweetness, closeness, nd nutritive character of the grasses—on rable lands, the improvement in the texture and mellowness of stiff clays, the more roductive crops, their better quality and the earlier period at which they ripen, compared with those grown upon soils to which no lime has ever been added. It is said to destroy sorrel.

This influence of lime is well seen when limed is compared with unlimed land, or when soils which are naturally rich in lime or compared with such as contain but little. Barley grown on the former is of better malting quality. The turnips of well-limed land are more feeding for both cattle and sheep. And the hillpastures on limestone soils, continue longer green in autumn, and yield a greater yearly return of milk and cheese, than the soils which are produced from sandstone rocks.

It is known that the frequent addition of lime, even to comparatively stiff soils long kept in arable culture, will at length so open them that the wheat crop becomes uncertain.

To lighter soils, again, and especially to such as are reclaimed from a state of heath, and contain much vegetable matter, the addition of a large dose of lime opens and loosens them, often to such a degree that they sound hollow, and sink under the foot. This effect is usually ascribed to an overdose lime, and the land is commonly said to be over-limed. In this state it refuses to grow oats and clover, though turnips and barley thrive well upon it.

Analyses of over-limed soils have shown that it is not an excess of lime which produces the evil, but a too porous or loose condition of the soil, which admits of the following remedies:—

(a) To eat off the turnips produced upon such soils with sheep; or,

(b) To consolidate the loose and open soil by the use of a heavy roller, a cold-crusher or peg-roller, or other similar mechanical means, or,

(c) To use the cultivator as much as possible instead of the plough, and thus to avoid the artificial loosening of the soil which is caused by frequent ploughing.

The way in which lime acts on the texture of a soil is a most interesting, but as yet little understood, subject. The chief difficulty in understanding it is owing to the complicated nature of this action.

One of the most important properties of lime is the power it has of lessening the pudding tendency of a clayey soil. This it does by coagulating the finely divided clayey particles a property which has led to the use of lime as a precipitant of sewage.

**IMPROVEMENT BY PARING AND BURNING**

A mode of improvement more often formerly resorted to than now on poor

lands is the paring and burning of the surface. The effect of this treatment is easily understood. The matted sods consist of a mixture of much vegetable with a comparatively small quantity of earthy matter. When these are burnt, the ash only of the plants is left, intimately mixed with the calcined earth. To strew this mixture over the soil is much the same as to dress it with peat or wood ashes, the beneficial effects of which are almost universally recognised. And the favourable influence of the ash itself is chiefly due to the ready supply of inorganic food it yield to the seed, and to the effect which the potash and soda, etc., which it contains, exercise either in preparing organic food in the soil, or in assisting its assimilation in the interior of the plant.

Another part of this process is, that the roots of the weeds and poorer greases are materially injured by the paring, and that the subsequent dressing ashes is unfavourable to their growth.

**CHANGES PRODUCED BY BURNING CLAYS**

When a soil is burnt, the organic portion of it is altogether, or nearly altogether, destroyed; the combustible (volatile) portion escapes into the atmosphere in the form of water, carbonic acid, etc., whilst its earthy and saline constituents remain in the soil in the form of a powder more or less fine. The soil loses nearly all its nitrogen in this way, and hence burning must be regarded as only advisable in very exceptional cases. In fact this method of improving soil is very rarely had recourse to now-a-days, as there are other more suitable and economical methods in use. Nevertheless it may be of advantage to describe the nature of the relations which take place in such treatment of soils. The saline and earthy substances derived from the combustion of the organic matter are of course identical with the mineral constituent plants: being in a pulverulent condi they are the more readily absorbed by growing vegetables.

In all soils capable of nourishing e the most worthless weed, there must potash. This substance exists in soils the most part in combination with sili and in such a form as to be insoluble the solvents present in soils. That though there may be abundance of pot in the soil, yet it is mostly insoluble, a not immediately available for the nouri ment of plant. By the action of frosts a by other agents, the rocky portions of t soil in which the potash is bound up l come broken up and reduced to powd during this operation potash is gradua set free, so to speak, and placed at t disposal of the plant. Burning the s expedites its disintegration and libera not only its potash, but some of its otl constituents. In an experiment made Dr. Voelcker, he found that unburnt cl contained 0.269 per cent of soluble pota whilst the same clay after burning co tained 0.941 per cent of potash soluble acidulated water. One most importa change produced in soils by burning therefore a great increase in the amou of soluble potash.

It would appear that it is lime whi displaces potash from its combination wi silica, when the potassium silicate of so is highly heated. Burning, therefore, d minishes the amount of calcium carbona in soils. In the first place, carbonic ac is expelled from the carbonate ($CaCO_3$ $CaO \times CO_2$), and caustic lime therel formed decomposes the silicate of pota sium, producing free potash and calciu silicate. It may happen, too, that part the calcium carbonate directly decompos the silicate, forming, by double decomp

ate, as suggested by Voelcker. Soda not in general so abundant in soils as ash; but, when it is present, its soluble tion is increased by the operation of ning. Where much limestone is pre- t in a soil, burning, by effecting its ntegration, renders any phosphates it y contain more available.

IMPROVEMENT BY IRRIGATION

The irrigation of the land is only a re refined method of manuring it. The ture of the process itself, however, is ferent in different countries, as are also e kind and degree of effect it produces, d the theory by which these effects are be explained.

In dry and arid climates, where rain rely falls, the soil may contain all the ements of fertility, and require only ater to call them into operation. In such ses—as in the irrigations practised so xtensively in Eastern countries, and ithout which whole provinces in India ould lie waste—it is unnecessary to ppose any other virtue in irrigation than he mere supply of water it affords to the arched and cracking soil.

But in some climates there are several other beneficial purposes in reference to the soil, which irrigation may, and some of which at least it always does serve thus,

The occasional flow of pure water over the surface, as in our irrigated meadows, and its descent into the drains, where the drainage is perfect, washes out acid and other noxious substances naturally generated in the soil, and thus purifies and sweetens it. The beneficial effect of such washing will be readily understood in the case of peat-lands laid down in water-meadow, since, as every one knows, peaty soils abound in matters unfavourable to general vegetation. These substances are usually in part drawn off by drainage, and in part destroyed by lime and by exposure to the air, before boggy lands can be brought into profitable cultivation.

NATURE OF DRAINAGE WATERS

But it seldom happens that perfectly pure water is employed for the purposes of irrigation. The waters of rivers, as they are diverted from their course for this purpose, are more or less loaded with mud and other fine particles of matter, which are either gradually filtered from them as they pass over and through the soil, or, in the case of floods, subside naturally when the waters come to rest. Or in less frequent cases, the drainings of towns and the water from common sewers, or from the little streams enriched by them, are turned with benefit upon the favoured fields. These are evidently cases of gradual and uniform manuring.

Even where the water employed is clear and apparently undisturbed by mud, it almost always contains ammonia, nitric acid, and other organic and saline substances grateful to the plant in its search for food, and which plants always contrive to extract, more or less copiously, as the water passes over their roots. The purest spring-waters and mountain-streams are never entirely free from impregnations of mineral and vegetable or animal matter. Every fresh access of water, therefore, affords the grass in reality another liquid manuring.

The kind of saline substances which spring-water or that of brooks contains depends upon the nature of the rocks or soils from which it issues or over which runs. In countries where granite or mica-slate abounds, potash and soda, and even magnesia, may be expected in notable quantities; while in limestone districts the

*waters are generally charged with lime. The value of the mountain-streams for the purpose of irrigation in limestone districts is so well known, that some have been inclined to undervalue all the constituents of natural waters, and to ascribe little worth as irrigators to the clear waters of brooks and springs which are not rich in lime. This opinion, however, is not in accordance with the results of the analysis of waters which have been profitably employed for irrigation.*

Flowing water also drinks in from the air, as it passes along, a portion of the oxygen and carbonic acid of which the atmosphere in part consists. These gaseous substances it brings in contact with the leaves at every moment, or it carries them down to the roots in a form in which they can be readily absorbed by the parts of the plant. It is not only unlikely that, in consequence of this mode of action, even absolutely pure water would act beneficially if employed in irrigating the soil.

Further, the constant presence of water keeps all the parts of the plant in moist state, allows the pores of the leaves and stems to remain open, retards the formation of hard woody fibre, and thus enables the growing vegetable, in the same space of time, to extract a larger supply of food, especially from the air. In other words, it promotes and enlarges its growth.

In the refreshment continually afforded to the plant by a plentiful supply of water—in the removal of noxious substances from the soil in the frequent additions of enriching food, saline, organic or gaseous, to the land in the soft and porous state in which it retains the parts of the plant, the efficiency of irrigation seems almost entirely to consist.

*It is known that waters which have passed over the surface of a field become sensibly less fertilising. This is easily explained by the reasonable supposition that the plants among which they have flowed have deprived them of a portion of their enriching matter.*

**IMPROVEMENT BY ROTATION OF CROPS**

The experiments of Lawes and Gilbert show that soils become exhausted of certain of their constituents sooner than of others. The substance which disappears soonest in the case of certain kinds of cropping is nitrogen; but there are other crops which deal gently with the nitrogen: and drawn largely upon some of the mineral ingredients of the soil. During the growth of leguminous crops, nitrogen accumulates in the surface-soil.

If two crops of unlike kinds be sown together, their roots retain the inorganic substances of the soil in different proportions, the one more potash and phosphoric acid perhaps; the other more lime, magnesia, or silica. They thus interfere less with each others than plants of the same kind do which require the same kinds of food in nearly the same proportions.

Or the two kinds of crop grow with different degrees of rapidity or at different periods of the year: while the roots of the one are busy drawing in supplies of inorganic nourishment, chiefly from great depths, those of the other are only able to take up food from the surface-soil.

If each crop demands special substances, or these substances in quantities peculiar to itself, or in some peculiar state of combination, the chances that the soil will be able to supply them are greater the more distant the intervals at which the same crop is grown upon it. Other crops do not demand the same substances in the same proportions; and thus they may gradually accumulate in the soil till it becomes especially favourable to the particular one we wish to grow.

ppose the soil to contain a certain ge supply of all those inorganic ances which plants require, and that same corn crop is grown upon it for a series of years, this crop will carry some of these substances in larger portion than others, so that year by r the quantity of those which are thus efly carried off will become relatively s. Thus at length the soil, for want these special substances, will become able to bear a good crop of this kind all, though it may still contain a large ore of the inorganic substances which her plants do not specially exhaust. uppose bean or turnip crops raised in ke manner for a succession of years, they ould exhaust the soil of a certain set of ubstances till it became unable to grow em profitably, though still rich perhaps n those things which cereals especially lemand.

But grow these crops alternately, then the one crop will draw especially upon one class of substances, the other crop upon another: and thus a much larger produce of each will be reaped from the same soil, and for a much longer period of time. On this principle the benefit of a rotation of crops in an important degree also the capacity of different crops for obtaining their food constituents. It is therefore, not merely the amount of these food constituents which the different crops remove from the soil that has to be taken into account in considering the effect of the rotation of crops, but also the capacity which they possess for absorbing their food from the soil, and in this respect crops differ very markedly. Another important point in considering the rotation of crops is the nature of the crop-residue. This is the chief source of the humus matter in the soil. In this respect crops differ very considerably. Those leaving the least amount of residue are the root-crops; while those leaving most are clover and grass. Cereals leave a considerable amount of residue, but the quality of this in fertilising a constituent is poorer than in the case of grass, which enriches the soil to a very considerable extent in nitrogen.

## IMPROVEMENT BY MANURING

In a state of nature there is a process of enrichment going on in every soil. The surface-soil becomes enriched by a steady accumulation of the elements of fertility. This is due to the fact that the plants growing on the soil collect, by means of their roots, fertilising matter from the deeper soil-layers. At the same time, a certain increase in the total nitrogen of the soil takes place, due to that coming from the atmosphere. This process of enrichment of a soil in nitrogen may go on for a long time. It would seem, however, that there comes a time when the loss by drainage becomes equal to the amount gained from the air, and the amount of nitrogen in the soil no longer increases. When, however, land is under arable cultivation, there is a constant loss of fertilising constituents due to that removed in crops. But the quantity of mineral matter which even the most exhaustive crop removes from the soil is extremely small when compared with the amount which the crop leaves untouched. If, however, crop after crop be taken from the soil, and if no manure be given in return for the matters abstracted therefrom, can such a system be carried on for an indefinite period? Baron Liebig was one of the first to point out that it could not, and that such a system must inevitably, in a state of nature, result in the exhaustion of the land. Indeed in many of his valuable works the great German chemist has drawn very gloomy pictures of the future condi-

*tion of agriculture in most civilised countries. Large quantities of food substances consumed in towns, and the effete matters which result therefrom, instead of being* returned to the soil from which they were procured, are in the form of sewage discharged into the ocean, and lost to agriculture.

### NEED OF MANURING

By repeated growing of crops the nutritive value of the soils decreases. The crops produced upon a farm take out of its soils certain quantities of mineral matters and nitrogen. So to keep these matters in the soils a judicious application of manures is indispensable. The amount of the proper manure to be added to the soil may be known by the chemical analysis of the soil before cultivation, which we now discuss.

### CHEMICAL ANALYSIS OF SOIL

Before proceeding to describe the method of soil analysis, we must first find out what substances in the soil are of importance to plants, since the object of analyzing a soil is to determine its fertility, i.e. the amount of plant food substances contained in it.

We have already acquainted with the fact that all plants contain a certain quantity of inorganic material called the ash, and by the ordinary methods of qualitative analysis we can prove that plant ash invariably contains the following substances—Lime, magnesia, potash, soda and iron oxide; phosphoric, hydrochloric, sulphuric and carbonic acids; and silica. With the exception of carbonic acid, these substances do not exist in the air, and the plant must therefore get them from the soil. The relative amounts of these substances in plant ash vary greatly according to the plant, or the organ from which the ash is obtained. Broadly speaking, the ash of seeds contains much lime and phosphoric acid, that of stems and leaves, such as straw or hay, much potash and silica, and that of wood much potash and carbonic acid. Lime, potash and phosphoric acid are the most abundant constituents; magnesia, soda, iron oxide, and hydrochloride and sulphuric acids are usually present in comparatively small quantities. Carbonic acid in the ash comes from the burning of the plant's carbon in the process of incineration, while silica is so abundant in every soil that there is no need to estimate its percentage.

### NEEDS OF PLANTS FROM SOIL

The most important substances therefore which the soil has to provide for plants are lime, potash, and phosphoric acid. But by examining only the ash, we have omitted to notice another very important constituent of plants which has to be obtained from the soil—nitrogen. This element exists in the air, but in the free state, and it has been proved that most crops cannot directly use it in this state, but must obtain it in the form of compounds from the soil. The amount of nitrogen in plants is large, and we must add it to lime, potash, and phosphoric acid, in our list of the important substances to be supplied to the plant by the soil. In analyzing a soil for practical purposes, these four substances are the chief ones to which we must direct our attention.

In making an analysis of a soil, we may go to work from either of two points of view:— (1) To find out how great a store of plant food substances the soil contains, in which case we require to find the total percentages of lime, potash, phosphoric acid and nitrogen present. (2) To find out the amounts of each of these substances available for plant food at the time of taking the sample. This is a much more difficult matter than to determine the total quantities, for we are not as yet

letely informed of the manner in h plant food substances are dissolved of the soil for absorption by the roots. The total percentage are determined ollows:—

10 grams of the fine dry soil are ghed out into a crucible and dried at °C. until there is no further loss of ght. The total loss of weight gives amount of moisture in the fine soil.

### ORGANIC MATTER

The soil in the crucible is then ignited t over a small flame, which is gradually ned up until the crucible is raised to a ll red heat. During the heating the soil occasionally stirred with a stiff platinum re The treatment burns off all the ganic matter humus the percentage of hich is calculated from the loss of weight.

### OTASH, LIME AND PHOSPHORIC ACID

The ignited soil is now transferred to beaker, and boiled for half an hour with c.c. of a mixture of strong hydrochloric cid and water, half and half. More ater is then added, and the whole is oured on to a filter and washed with hot ater. The filtrate is made up to a known olume, say 500 c.c. The lime, potash, tc., are then determined in portions of 100 c. by the ordinary methods of quantita-tive analysis.

### INSOLUBLE POTASH

The whole of the *lime* and *phosphoric* *cid* is dissolved by this method, but hy-lrochloric acid does not extract the whole f the potash. To get all the *potash* into olution, 10 grams of soil is mixed with ure calcium carbonate and ammonium hloride in a platinum crucible slowly aised to a red heat and kept, at that tem-erature for an hour. The crucible is hen allowed to cool and the contents oiled in water, when all the potash dis-olves, and can be estimated in the rdinary way.

### TOTAL NITROGEN

To determine the total *nitrogen*, 10 grams of soils is mixed with soda-lime, and heated in a hard glass tube, the am-monia given off being estimated by any of the usual methods.

In this way we can determine the per-centages of water, organic matter, lime, potash, phosphoric acid and nitrogen present in the fine soil.

The percentage of water is required simply to enable us to calculate the per-centage of the other substances in the dry soil so that the numbers obtained may be comparable. Suppose, for instance, we find that the fine soil contains 1.35 per cent. of water, then 100 grams of fine soil contain 100—1.35 grams = 98.65 grams of dry soil. Suppose we find that the percentage of potash in the fine soil is .67, we must divide this number by .9865 to get the percentage in the dry soil. Thus percentage in fine soil, .67, divided by .9865 = .68, percentage in dry soil.

The percentages of each constituent may be calculated into lbs. per acre—

Amount of fine dry soil per acre =2,439,360 lbs.

Percentage of potash in dry soil as above—.68

Amount of potash per acre

$$= \frac{2,439,360}{100} \times .68 \text{ lbs.} = 16.600 \text{ lbs.}$$

When this method of sampling has not been followed, we may take it as near enough for practical purposes that one acre of dry soil nine inches deep weighs 3,000,000 lbs., and we shall therefore get the weights per acre of each constituent by multiplying the percentage by 3,000,000 i.e., by 30,000. Thus, suppose percentage of phosphoric acid is found to be .185: then weight of phosphoric acid per acre =.185×30,000 lbs.=5550 lbs.

In agricultural analysis of either soils or manures, lime is always expressed as $CaO$, potash as $K_2O$, and phosphoric acid as $P_2O_5$.

### AMOUNT OF PLANT FOODS IN SOILS

The amounts of lime, potash, etc., found by analysis are very variable.

Lime varies from as much as 30 per cent. or more in marls, to less than .5 per cent. Soil containing less than 1 per cent. may be regarded as deficient in that substance.

Potash in clay soils may be as much as 1 per cent., and occasionally rather more, but in light soils it is sometimes less than .1 per cent.

Phosphoric acid varies from about .3 per cent. to less than .1 per cent.

Nitrogen amounts to about .2 per cent. in old pastures, but only to .05 per cent. in some arable lands.

### AVAILABLE PLANT FOOD

To estimate the percentages of plant food substance available in the soil at any time is a very difficult matter. Our knowledge of the exact manner in which food salts are dissolved by the soil water for absorption by the root-hairs is not as complete as it might be, nor are we sure that it is the same in all plants. At any rate, the powers possessed by different crops of extracting, say, phosphoric acid from the soil are very different. A soil which contains plenty of phosphoric acid available, say, for wheat, may produce but a poor crop of swedes unless largely dressed with some phosphatic manure. The whole question of availability is therefore a very dfficult one in the present state of knowledge. Many attempts have been made to determine the amounts of minerals, i.e., potash and phosphoric acid, available in a soil, such as determining the amounts soluble in dilute hydrochloric acid, acetic acid and other acids, but the m scientific suggestion is that made quite cently by Dr. Bernard Dyer. Start from the botanical side of the question, argues that if the root hairs exude an a juice, which exerts a solvent action on food substances in the soil particles, amounts of these substances available the plant must depend on the acidity of root juice exuded. He has determined acidity of the root juices of all the or nary agricultural plants, and finds tha is equivalent on the average to the acic of a one per cent. solution of crystalli citric acid.

He has determined the amounts potash and phosphoric acid soluble in ci acid solution of this strength present the soils of the various plots from Rothamsted permanent barley field, a finds that the amounts soluble agree v well with the amounts of available pot and phosphoric acid, as indicated by known manuring and crop result of e plot.

The method has also been applied the soils of a number of experimer fields in Norfolk and Suffolk, and amounts of potash and phosphoric a dissolved by the one per cent. citric a solution have agreed in every case · w the amounts indicated as available by field experiments.

It therefore appears probable that t method will give us an idea of the amou of mineral food substances available i soil at any time, though there are still c tain difficulties in its practical applicat such as the varying availability to diff ent crops.

The method of procedure is to put i a clean Winchester quart 200 grams fine dry soil, 2 litres of water, and grams of crystallized citric acid, and allow them to stand for seven days w

occasional shaking. At the end of the time the solution is filtered off, and two lots of 500 cc. evaporated down to dryness and ignited to burn off the citric acid. The potash is determined in one and the phosphoric acid in the other by the ordinary methods.

### AVAILABLE NITROGEN

The availability of the nitrogen in the soil varies greatly according to the time of year, the amount of rainfall and drainage, and the crop growing on the soil.

At any time most of the nitrogen exists as humus, in which form it is of course insoluble in water, and therefore not available for plant food.

Under the proper conditions, however, the humus undergoes a series of changes, which will be more fully dealt with later, which convert its nitrogen first into ammonia compounds and then into nitrates.

It is usually accepted that plants absorb their nitrogen from the soil in the form of nitrates, chiefly nitrate of lime, so that to determine the amount of nitrogen available we must determine the amount of nitrogen present as nitrates. But ammonia changes to nitrates so rapidly in the soil, that nitrogen in the form of ammonia may also be taken as available. Since changes in the state of the nitrogen occur in a soil on keeping, both nitrates and ammonia must be estimated in a perfectly fresh, undried sample.

### EXTRACTION OF NITRATES

The percentage of nitrogen as nitrate in a soil is determined as follows:—500 grams of the soil is placed in a deep funnel at the bottom of which is a perforated porcelain plate covered with a filter paper. 50 c.c. of water is poured on to the soil, and allowed to stand for five or ten minutes. The funnel must be inserted through a cork into a bottle with a side tube which can be connected with an air-pump. The pump is set to work, and the water sucked out of the soil into the bottle. A second 50 cc. is now added, and sucked through as before. The nitrates so are soluble and easily washed out of a soil, that the water sucked through carries with it all the nitrates, which can then be estimated, after evaporating the solution, by any of the ordinary methods. The amount of nitrogen found as nitrate will vary with the time of year, the temperature, the rainfall, etc.

### ESTIMATION OF AMMONIA IN SOILS

The ammonia present in a soil at any time may be determined as follows:—200 grams of the soil is placed in a flask connected with a condenser, two litres of water perfectly free from ammonia is added, with two grams of magnesia. 500 cc. of water is distilled from the flask into a receiver containing a measured volume of standard sulphuric acid. The ammonia can then be estimated from the amount of acid neutralized, and so we can calculate the percentage of nitrogen as ammonia contained in the soil. The percentage found will vary greatly, as in the case of nitrates.

The nitrogen as nitrate, added to that as ammonia, may be taken as the total nitrogen available at the time of sampling the soil.

After chemically analysing the soils one may be able to ascertain the food requirements of a particular crop and then apply the suitable mannure to the soil to supply the food of the plant for its nourishment and growth. A brief description of food requirements of crops is given below.

### FOOD REQUIREMENTS OF CROPS

The amount of fertility removed from an acre of soil producing average crops varies between wide limits. Crops which

remove the most fertility do not always require the most help in obtaining their food. This is because the amount of plant food assimilated is not a measure of the powers of crops to obtain food. An acre of corn requires over twice as much nitrogen as an acre of wheat, but wheat often leaves the soil in a more improverished condition than corn, because corn has greater power to procure nitrogen and utilize that formed by nitrification after the wheat crop has completed its growth. The available nitrogen if not utilized by a crop may be lost in various ways. It was formerly believed that plant food in the matured crop indicated in kind and amount of fertilizing ingredients to apply and that a correct system of manuring required a return to the soil of all elements, removed in the crop. Experiments show this view to be incorrect. For example, an acre of wheat contains 35 pounds of nitrogen, while an acre of clover contain 70 pounds, if 70 pounds of nitrogen were applied to an acre of clover and 35 pounds to an acre of wheat, poor results would follow, because clover can obtain its own nitrogen while wheat is unable to do so, and the 35 pounds would not necessarily come in contact with the roots so that all could be assimilated. While the amount of plant food removed in crops cannot serve as the basis for their manuring valuable results are obtained from study of the different elements of fertility which they contain. Moreover, the influence of the crop upon the soil and the power of the crop to obtain its food, must also be considered.

It is believed that crops procure some of their food from minerals insoluble in water. It is a fact that plants have the power of rendering a portion of their food soluble, provided it does not exist in forms too inert to undergo chemical change. According to the experiment of Liebig it was found that 92 per cent of the potas was obtained from form insoluble in wate

The soluble plant food from a fertil soil is not generally sufficient for plan growth. When oats, wheat, and barle are seeded in prepared sand and waterec with the haching from a pot of fertile soil they made only a limited growth. Oat grown in prepared sand and watered witl soil haching assimilated only 25 per cent as much phosphoric acid as plants grown in fertile soil. The character and concentration of the soil solution are, however, important factors in crop production and some soils may contain sufficient amounts of water soluble elements to produce crops. The relative amounts of food which plants take from the soil solution and that which they render soluble have not been extensively investigated.

In the roots of the plants there are various organic acids and salts. Between the roots and the soil is a layer of water. The plant sap and the said water are separated by plant tissue, which serves as a membrane. All of the conditions are favourable for osmosis. The sap from the roots finds its way into the soil in exchange for some of the soil water. The acid and other compounds, excreted by the roots, act upon the mineral matter, rendering portions of it soluble, and then it is taken up by the plant. Different plants contain different kinds and amounts of solvents, as well as present different areas of root surface to act upon the soil, and the result is that agricultural crops have different powers of assimilating food. This action of living plant roots upon soil is a digestion process which is somewhat akin to the digestion of food by animals.

Plants not only possess the power of rendering a portion of their food soluble, but also they are able to select, and to reject that which is unnecessary. For example, wheat grown on a soil ...

equally abundant and soluble forms as
: potash will contain relatively little soda
npared with the potash; also many sea-
eds contain more potash than soda, al-
ough the sea water in which they grow
s an excess of sodium salts.

For the feeding of crops, a nutritive
l solution is desirable, and the soil
ould have a good stock of reserve mate-
l that can be utilized either by action
the plant roots or readily pass into
ution in the soil water.

### CEREAL CROPS

Cereal crops contain a high per cent of
ca and evidently possess the power of
ding upon some of the simpler silicates
the soil, liberating the base elements
l using them as food, while the silica is
posited in the outer surface of the straw.
hough the cereal crops do not remove
ge amounts of total nitrogen from the
l, require special help in obtaining this
ment. There is, however, a great di-
ence among the cereals as to power of
imilating nitrogen. Next to nitrogen
y stand most in need of phosphoric
d. There exists in many soils a greater
iciency of available phosphoric acid
l potash than of nitrogen, although
eal crops are better able to procure
se elements than they are of nitrogen.
e humic phosphates are utilized by
rly all the cereals.

### WHEAT

This crop is more exacting in its food
uirements than barley, oats or rye. It
comparatively a weak feeding crops,
l the soil should be in a higher state
fertility than for other grains.

The food requirements of wheat are
h that it should be given a favoured
ition in the rotation. It is not advisable
have wheat follow barley, because the
will be too porous, and barley being
a stronger feeding crop leaves the land in a poor state as to available plant food. When corn has been well-manured, wheat may follow. The food requirements of wheat are best satisfied following a light, oats, which have been grown on heavy sod, or following corn that has been well manured. When wheat is judiciously grown in a rotation and farm manures are used, it is not an exhausting crop. Light dressings of farm manure may be used on land that is being prepared for wheat. On many soils, dressings of phosphate and potash, either alone or in combination, materially increase the yield and improve the quality of the crop. Nitrogen alone does not give as good results as when combined with minerals.

### RICE

The growth of paddy requires water. As a rule manure is not considered essential, when water is sufficient, unless the land is poor. But the production may be increased by the application of, fertilizers such as bone meal, kainit and farm yard manure. Assuming the average yield to be about 900 lbs per acre neglecting the amounts absorbed by the stubble and the roots, such a crop removes the soil about 29.33 lbs nitrogen, 9.14 lbs phosphoric acid and 49.69 lbs potash. So the addition of 1 to 1½ cwt. of bone dust and 1½ cwt kainit to the ordinary 4 or 5 tons of cattle manure on well-cultivated wet lands will produce brun per crops and on dry lands a mixture of 1 cwt bone dust and 1 cwt. kainit will prove equally successful and ashtonish the surrounding farmers by the weight and the excellence of the crops. Where cattle manure are not available 3 to 5 cwt of groundnut or castor cake meal, 1 cwt of bonedust and 1 to 2 cwts. of kainit should be employed, carefully mixed, and spread evenly over the field after the grasses have rotted. and

the return will be so great as not merely to pay for the cost of the manures, but there will be an extra profit.

**BARLEY**

While wheat and barley belong to the same general class of cereals, they differ greatly in the habits and food requirements. Barley is a stronger feeding crop. has greater root development near the surface, and can utilize food in a cruder form. Barley thrives best on a open soil, and has greater nitrogen assimilative power than wheat. Barley, however, responds liberally to manuring, particularly to nitrogenous manures.

**OATS**

Oats can obtain food under more adverse conditions than either barley or wheat. They are also less exacting as to the physical condition of the soil. The oat plant will adopt itself to either sandy or clayey soil, and will thrive in the presence of alkaline matter or humic acid when wheat would be destroyed. In a rotation, oats usually occupy a position less favoured by manures, they are, however, greatly benefited by fertilizers, particularly those of a nitrogenous nature. The oat crop responds liberally to manuring.

**MAIZE**

Under ordinary conditions maize requires most help in obtaining phosphoric acid. It removes a large amount of gross fertility, and if its production, is long continued without the use of manures it impoverishes the soil. Its habits of growth is met that it generally leaves an average soil in better mechanical condition for succeeding crops. Maize is not injured as are many grain crops by heavy applications of stable manure and does not produce waste products which are destructive to itself. The conditions are better for wheat culture after one or two corn crops have been removed from richs newly broken . The food requirements of maize are satisfied by applications of stable manure occasionally re-enforced with a little nitrogen and phosphoric acid, and in the case of some soil potash. After clover, corn gives excellent returns, and when maize is the chief market crop it should be favoured by having the best position in the rotation.

**POTATOES**

Potatoes are surface feeders, and when grown continuously upon the same soil without manure, the yield per acre decreases more rapidly than that of any other farm crop. Potatoes require liberal general manuring re-enforced with wood ashes or other potash fertilizer. In the rotation they should follow grain or pasture, provided the fertility of the soil is kept up. Commercail fertilizers for potatoe production should contain a fair amount of available nitrogen (2 to 3 per cent) and a more liberal supply of phosphoric acid and potash.

**COTTON**

On average soils cotton stands in need first of phosphoric acid and second of nitrogen. It is most able to obtain potash. Organic nitrogen as cottonseed meal and stable manure appear equally as effective as nitric nitrogen. Phosphoric acid must be applied in the most available forms, although the crop uses but little. The fertilizers should be drilled in at the time of planting. The use of green manuring crops as cowpeas, with an application of marl or limestone gives beneficial results. There are but few crops which respond so readily to fertilizers as cotton. It does not remove a large amount of fertility, but when not systematically grown in a rotation exhausts the soil in the same way as when grain is grown confinuously.

### LEGUMINOUS CROPS

...or leguminous crops potash and lime ...izers have been found of special ... Farm manure on sandy or heavy ... soils will materially assist in the ...duction of clover.

### SUGARCANE

Sugarcane grows in all kinds of soils ...t the best canes grow at the junction of ...l and new alluvia on the sides of streams ...d rivulets. These are red clay loam ...ls specially rich in mineral matters. For ...owing superior varieties of canes the ...l should be supplied with a quantity of ...edust and mineral phosphate, which ...uld be applied to the one in 5 years ...the rate of 10 maunds per acre. The ...ility may also be increased by the uses ...sulphate of ammonia or saltpetre. But ...osphatic manure is indispensable for su...cane in addition to cattle-dung, oil-cake, ...where the land is annually renovated ...silt, and where such land is utilised for ...wing an aquatic variety of sugarcane, ...special manuring is needed.

### JUTE

With the exception of rocky, laterite ... poor sandy soils, all soils are adopted ...jute cultivation. Rich loam, of course, ...s the best result. The coarse varieties ...w luxuriantly in low lying lands, but a ...er quality of fibre is obtained from ...sland. Pulses, oats, barley, wheat, to...co and Aus paddy are grown on such ...ls in rotation. Where there is net ...osit no manuring is required. Else...ere cowdung at the rate of 150 maunds ...acre may be applied where necessary. ...fibre crops are appreciably benefited ...cowdung manure, except those belong... to the leguminous order.

### TOBACCO

Tobacco requires particularly good and heavy manuring, as it is richer in nitrogen and in mineral constituents than almost any other crop. The most appropriate manures for the cultivation of tobacco crop are wood ash, saltpetre, gypsum, and superphosphate of lime.

### TEA

Tea is an exhausting plant. The exhaustion should be covered by the application of suitable manure. The manures specially applicable to this crop are saltpetre and castor cake. But rape-cake, ashes, lime, salt, soot, alum, sulphate of copper, catechu, etc., and especially the first five which have manurial value, should be applied, as well as saltpetre or castor-cake, for renovating the soil and ridding it of insect and fungus pests.

### GARDEN CROPS

For general garden purposes, there should be a liberal supply of plant food. Well-composted farm manure can advantageously be re-enforced with commercial fertilizers. A liberal use of manure insures not only the maximum yield, but crops of the best quality. Maturity of crops also is influenced by fertilizers. A suitable fertilizer for general garden purposes may contain the following:—

| | |
|---|---|
| Nitrogen | 4 p. c. |
| Phosphoric acid | 8 „ |
| Potash | 10 „ |
| Farm manure | rest. |

To meet the requirement of special crops such as cabbage, etc. an additional dressing of nitrate of soda may be used.

For early maturing garden crops, a fair but not excessive amount of nitrogen should be applied, also a liberal supply of phosphates will be found advantageous. Some garden crops thrive best when their food is in organic forms as the humate compounds derived from farm manures. A continuous supply of available plant food is thus furnished to the growing crop.

*Onions are benefited by a generous dressing of soluble nitrogen.* Tomatoes require general fertilizing, for early maturity, nitrogen, as nitrate of soda, is beneficial, but an excess should be availed; for late maturity, farm manures may be used. For general garden purposes, a complete fertilizer is preferable to an amendment, as a better balanced growth is secured which favourably affects both the yield and the quality.

### FRUIT TREES

In the manuring of fruit trees, the first object is to produce thrifty trees, as subsequent fertilizing for fruit will not give satisfactory results with poorly grown and partially developed trees. In order to promote growth, a liberal supply of a complete fertilizer should be used, and the soil should be kept in the best mechanical condition. The quality of the fruit is often adversely affected by a scanty supply of plant food. A quick acting fertilizer, containing kainit, nitrate of soda, and dissolved phosphate rock, should be used in the spring, followed if necessary by a light dressing of some manure which yields up its fertility more slowly. An excess of nitrogen, however, should be avoided. Stone fruits are benefited by the addition of lime to the ferilizer. Lime fertilizers impart hardiness to fruit trees.

### SMALL FRUITS

On account of the camparatively limited bearing period of small fruits, the land should be brought to a high state of productiveness and good physical condition by liberal use of farm manures previous to planting. Quick acting fertilizers are the most suitable for small fruits. Dressing of nitrate of soda 50 to 100 lbs per acre can be applied early in the season to promote leaf activity. This should be followed by an application of a general fertilizer containing about 3 per cent of available nitrogen, 8 per cent of phosphoric ac[id] and 10 per cent of potash. The amou[nt] used should range from 200 to 400 lbs p[er] acre until the character and needs of [the] soil are determined.

### ROTATION OF CROPS AND CONSERVATIO[N] OF SOIL FERTILITY

The object of systematic rotation [of] crops is to conserve the fertility of the s[oil] and at the same time to produce maxim[um] yields. In order to accomplish this, th[e] food requirements of different crops mu[st] be met by good cultivation and judicio[us] manuring. Rotations must be planne[d] according to the nature of the soil and th[e] system of farming that is to be followe[d]. For general grain farming a different rotation is required than for exclusive dairying. Whatever the nature of farming, th[e] whole farm should gradually underg[o] a systematic rotation. If the farm is uneven in soil texture, different rotations may be practised on the various parts. There is no way in which soils are more rapidly depilated of fertility than by the continued culture of one crop.

When renumerative crops can no longer be produced, the soil is said to be exhausted. Soil exhaustion may be due either to a lack of plant food, to bacterial products, or to poor physical conditions arising from the soil being temporarily out of a one-crop system and poor methods of cultivation.

### PRINCIPLES INVOLVED IN CROP ROTATION

There are a few fundamental principles with which all rotations should conform. Briefly stated these are:—

1. Deep and shallow-rooted crops should alternate.

2. Humus consuming and humus producing crops should alternate.

3. Crops should be rotated so as to make the best use of the preceding crop residue.

Having dealt with the growing of all the major crops we now devote our attention to the cultivation of kitchen vegetables. And for this purpose a reproduction of a chart as recommended by the well-reputed Globe Nursery of Calcutta will surely go a long way in solving this difficult problem.

**"BHADOI" VEGETABLES (Summer & Rains).**

| Name of Crop. | Nature of soil. | Method of sowing or planting. | Period of showing or planting. | Period of harvest. | Seed-rate per acre. | Approximate outturn per acre. |
|---|---|---|---|---|---|---|
| **Brinjal (Begun)** | Well-drained loam. | Early varieties transplanted in April-May and late varieties in July-August. Distance 3′ each way. | For early varieties seed-beds should be prepared in Feb-March & for late varieties in May-June. | Early varieties, August to February. Late varieties, October to April. | 4 to 6 chhataks | 100 to 150 mds. |
| **Lady's finger (Dhenras)** | Loam ... | Seeds should be sown 2′ to 3′ apart in lines. | Middle of April to middle of June. | Middle of June to middle of August. | 3 to 4½ seers ... | 60 to 80 mds. |
| **Gourd (Lau)** ... | Loam ... | Seeds should be sown in beds 6′ apart. | Middle of May to middle of July. | After 3 or 4 months ... | ½ to ¾ seer ... | 100 to 125 mds. |
| **Pumpkin (Kumra).** | Loam ... | Seeds should be sown in beds 6′ apart. | March-April and May ... | After 3 or 4 months ... | ½ to ¾ seer ... | 100 to 125 mds. |
| **Snake Gourd (Chichinga).** | Loam ... | Seeds should be sown in beds 6′ apart. | Middle of April to middle of June. | August-September ... | 1 to 1½ seers ... | 90 to 100 mds. |
| **Gourd (White) (Chal Kumra)** | Loam ... | Seeds should be sown in beds 6′ apart. | Middle of February to middle of April. | After 4 months ... | 1 to 1½ seers ... | 90 to 100 mds. |
| **Gourd (Bitter) (Karela).** | Loam ... | Seeds should be sown in beds 6′ apart. | Middle of February to middle of April and May | After 3 months ... | ¾ to 1 seer .. | 90 to 100 mds. |
| **Jhinga (Pala Jhinga).** | Sandy loam | Seeds are sown in beds 4′ to 6′ apart. | Middle of April to middle of July. | After 2 to 3 months of planting. | 1½ to 2 seers ... | 100 to 150 mds. |
| **Kankri** ... | Sandy loam | Seeds are sown in beds 4′ to 5′ apart. | Middle of March to middle of May. | In the rains ... | ½ to ¾ seer ... | 80 to 100 mds. |
| **Country beans (Sheem).** | Sandy loam | Seeds are sown in beds 4′ to 6′ apart. | Middle of May to middle of July. | Middle of November to middle of January. | 4½ to 6 seers ... | 90 to 120 mds. |
| **Broad beans (Bakla Sheem)** | Loam ... | Seeds are sown 8″ to 12″ apart. | Middle of June to middle of August. | After 3 months ... | 4 to 6 seers ... | 90 to 120 mds. |
| **Radish (Moola)** | Sandy loam | Seeds are broadcast ... | Middle of March to middle of July. | After 2 months ... | 2 to 4 seers ... | 125 to 150 mds. |
| **Cape Gooseberry (Tepari).** | Loam ... | 2′ apart ... ... | Middle of April to middle of June. | After 4 months ... | 6 to 8 tolas ... | — |
| **Uchchhe** ... | Loam ... | 3′ to 4′ apart ... ... | Middle of February to middle of April. | Middle of June to middle of August. | ¾ to 1 seer ... | 100 to 125 mds. |
| **Sags — Note, Pui, Danta, Sulfa, etc.** | All kinds of soils. | Seeds are broadcast ... | Middle of May to July ... | After 1½ months ... | 6 chhataks to 8 chhataks. | — |

**"RABI" VEGETABLES (Winter Season).**

| Name of Crop. | Nature of soil. | Method of sowing or planting. | Period of showing or planting. | Period of harvest. | Seed-rate per acre. | Approximate outturn per acre. |
|---|---|---|---|---|---|---|
| **Brinjal (Kuli variety).** | Loam ... | Seedlings, transplanted 2′—2½′ each away. | October to November ... | After 5 months ... | 4 to 6 chhataks | 100 to 150 mds. |
| **Jhinga (Bhuinya)** | Sandy loam | Seeds sown 5′ apart ... | Middle of December to middle of March. | After 2 or 3 months ... | 1½ to 2 seers ... | 100 to 150 mds. |
| | Loam ... | Seeds sown 6′ apart ... | Middle of September to middle of January. | After 3 months ... | ½ to ¾ seer ... | 100 to 125 mds. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sweet potatoes | Sandy loam | Cuttings are planted 3' apart. | September to October | February to March | 3,000 to 5,000 cuttings. | 100 to 150 mds. |
| [illegible] | Loam | 3' to 4' apart | Middle of October to middle of December. | Middle of February to middle of April. | ½ to 1 seer | 100 to 125 mds. |
| Radish (Meola) | Sandy loam | Seeds are broadcast | Middle of September to middle of November. | After 2 months | 2 to 4 seers | 125 to 150 mds. |
| Pumpkin | Loam | Seeds shown 6' apart | Middle of September to middle of November. | After 3 months | ¼ to ½ seer | 100 to 125 mds. |
| Sag—Palam | Loam | Seeds are broadcast | September to November | After 2 months | — | — |

## ENGLISH VEGETABLES.

| Name. | Months for sowing. | Quantity of seed required to sow in 100 yards row. | Whether sown straight to the land or to be raised in seed-beds. | Distance between drills and plants. | Remarks. |
|---|---|---|---|---|---|
| Beans (Runner and broad). | September to November. | 3 lbs. | Straight to the land | 1' between each seed in rows. | |
| Beans (Dwarf, Kidney). | August to November. | 3 lbs. | Straight to the land | 2½' to 2' respectively | |
| Beet | August to November. | 3 oz. | Straight to the land or in seed-bed. | 1' and 10" respectively | Frequent waterings with liquid manure are beneficial. Soil should be kept loose. |
| Cabbage | August to December. | 1 oz. | In seed-bed | 2' each | Watering essential. |
| Carrot | August to November. | 1½ oz. | Straight to the land | 6" to 7" each | Should be sown in drills, requires a deeply worked soil. |
| Cauliflower | July to November. | 1 oz. | Seed-bed | 2½' each | Watering is essential. Soil should be well worked up. It will require earthing up. The irrigation is done in the furrows. Patna variety is suited for early showing as it can stand rains much better than imported seeds. May be sown from middle of June to end of August. |
| Knolkhol | Sept. to Nov. | 1 oz. | Seed-bed | 1' each | |
| Lettuce | Sept. to Dec. | 1½ oz. | Seed-bed | 1' and 6". | Watering and manuring essential. |
| Onion | October to November. | 3 oz. | Seed-bed and also in ground. | 5" to 9" each | Soil should be kent loose. Frequent waterings are essential. |
| Peas | August to December. | 3 lbs. | Straight to the ground | 2' and 4' to 6" | Heavy manuring and frequent irrigation necessary. Stakes should be put in for the crop to climb up. |
| Radish | July to Jan. | 8 oz. | In ground | Broadcast. | |
| Spinach | Sept. to Dec. | 3 oz. | Straight to the ground | 1' and 9" respectively. | |
| Tomato | July to December. | ½ oz. | Seed-bed | 2½' to 2' respectively | Plants should be supported by sticks. May be planted on ridgas. |
| Turnip | September to [illegible] | 1½ oz | Straight to the ground | 6" apart | [illegible] |

4. Crops should be rotated so as to use nitrogen indirectly from atmospheric sources and to promote desirable bacterial activities in the soil.

5. Crops should be rotated so as to keep the soil in the best mechanical condition.

6. In arid regions, crops should be rotated so as to make the best use of the soil water.

7. An even distribution of farm labour should be secured by a rotation.

8. Farm manures and fertilizers should be used in the rotation where they will do the most good.

9. Rotations should be planned so as to produce fodder for stock, and so that every year there will be some important crop to be sold.

In dealing with the subject of rotations it is best to take actual problems as they present themselves and plan rotations that will best meet all of the conditions.

#### CONSERVATION OF FERTILITY

In order to conserve the fertility of the soil, not only must a systematic rotation be practical, but a proper use must be made of the crops produced when crops are sold from the farm and no restoration is made, soils are gradually depleted of their fertility. No soil has ever been found that will continue to produce crops without the use of manures. Many soils give large yields for long periods without manuring, but they are never able to compete in productiveness with similar soils that have been systematically cropped and manured. With a fertile soil the decline in fertility is so gradual that it is not observed; careful records are kept of the yields from year to year.

The use made of crops whether as food for stock or sold directly from the farm determines the future crop producing power of the soil. With different system of farming different uses are made of crops. when exclusive grain farming is followed there is no restoration of fertility, while in the case of stock farming, the manure produced contains fertility, in proportion to the food consumed. If good care is taken of the manures and in place of the grains sold, mill products are purchased and fed, there is no loss but often a gain of fertility.

Losses of fertility from farms are determined by the products sold, the care of the manure, and the fertility in the materials purchased and used on the farm. If an account are kept of the income and outgo of the fertility it would be found that with some systems the soil is gaining, while with others a rapid decline is occurring. In studying the income and outgoing of fertility, it is necessary to calculate the amounts of three principal elements, nitrogen, phosphoric acid, and potash in the crops and other products sold.

In the handling of manure it is impossible to prevent losses, but it is possible to reduce them to very small amounts. Hence in the calculations, a loss of 3 p.c. is allowed for mechanical waste and for uneven distribution of the manure; that is, in addition to the fertility sold from the farm a mechanical loss of 3 per cent is allowed for all crops raised and consumed as food by stock.

#### EROSION AND RECLAMATION

Erosion of soils may be caused by water, river and sea waves. It constitutes some of the most spectacular examples of total or partial loss of the soil and all that stands on it. Destruction of forest covers by deliberate human interference leads to increased run off of rain water and its diminished seepage and storage in the soil. The decomposing forest litter is no longer replenished by fresh falls of leaves or decaying roots and plant remains, and the soil organic matter and other plant nutri-

ents gradually diminish. The structure of the soil suffers: the run off increases, loosens the soil and transports it, sifting the sand and heavier particles in the process which are deposited near the scene of destruction and the finer parts go to make the streams turbid to be deposited far away. The muddy waters of our rivers carrying large quantities of silt and clay tell their own tale. The soil and all that stands upon it have been lost. And one of the first effects of these is to block the streams. No longer can the rain water be stored to feed the streams gradually over long periods after the monsoons are over. The increased run off, especially after heavy downpours, comes in a sudden rush and often gets blocked in the silted streams. The water develops power enough to cause devastating floods. The effects catch the eye when erosion has wrought its destruction, but the initial processes began to work long before. This type of water erosion arising from destruction of forest and grass cover has been going on for ages. The forest cover or a cover of suitable vegetation, e.g. natural grasses, has to be recreated in these eroded regions and nature must be allowed to heal the wounds by setting in motion processes of soil formation and growth of vegetation.

There are other types of water erosion though not so spectacular in their effects excepting some form of river or bank erosion. The latter has been responsible for sweeping away flourishing towns and villages. This sort of soil erosion may be eliminated by training the rivers so that they may be utilized for drainage and irrigation.

A much less slower form of water erosion which is cumulative in its effects and is therefore insidious, is that going on gently sloping lands and in the plains all through the country. Cross country railway journey bring home to us the extent of such erosion. Apart from partial or total loss of soil, these gentler forms and soluble salts and their effects on [illegible] of soil and its fertility can be very serious. The tendency to erosion in cultivated lands and areas without adequate forest cover depends on agricultural practices, as also on the soil, topography, the cover of vegetation and distribution and intensity of rainfall. These conditions vary according to locality, and control measures must be adopted to suit them. A good cover of vegetation and suitable methods of soil management aiming at a diminution of the velocity and volume of run off, such as bunding, terracing, contour cultivation strip cropping, tanks and ditches, drainage channels with a good grass cover, or of brick and cement or concrete, and preservation of soil structure, form the basis of measures for the control of water erosion.

Erosion also results from wind or wave action but much less information exists regarding their extent in India, partly because they are not so extensive as the others. Sand dunes are known in several parts of the country. Dust storms in summer are common experiences. One can see from the hills, e.g. in Simla, thick palls of dust resembling clouds which hang in the air and stretch over considerable distances.

Conservation of soil fertility is another fundamental aspect of soil reclamation. Crops and plants extract their nutrients from the soil. And the losses thus caused together with those caused by erosion, by climatic factors and by leaching by water must be made good in order that its productivity can be raised to and maintained at its optimum. Different plants make different demands on the soil. The imme-

and reserve powers of different soils eet these demands vary. The soil has its natural powers of transformation recuperation regarding some aspects s fertility. These powers also show ations.

Plants growing in natural associations soil and climate ensure a balance veen depletion and recuperation. The l condition is often attained in virgin sts and in steppes or prairies. The er types of soils develop under suitable atic and geological conditions under iduous forests and perennial natural sses. Grasses and legumes conserve organic matter and nitrogen and en- soil both physically and chemically. tivated crops make a great demand on soil, thereby causing depletion of the ck of nutrients in the soil and deterio- on of soil structure—the latter factor ders it more liable to erosion losses.

In temperate climates blessed with an n distribution of a moderate annual nfall, natural forces are favourable to maintenance of organic matter (hu- s) and nitrogen at a high level and of crobial activity. These are inter-related. ne manures, and fertilisers supply the ds of extractive farming. When soil pleting crops are used, rest and recu- ration from their depleting effects have be ensured also by suitable systems of ation which allow soil conserving crops act in turn with soil depleting ones. le peculiarities of Indian climatic con- ions—determined by a rainfall, often heavy downpours, concentrated within out four months; by a high mean tem- rature over the major part of the coun- r; and by a relatively dry winter and a y summer both accompained by bright nshine, which follow the rainy season : most favourable to the destruction of janic matter and soil nitrogen, to leaching by water, to deterioration of soil structure, to erosion, and to interruption of beneficial microbial activity. These peculiarities together with the failure of rains, especially a succession of such failures, excessive rainfall localised in short periods of time, floods, and insect pests constitute the most important limiting factors in our crop production. Every effort has therefore to be directed to find out and use all possible methods aiming at the control of erosion, the maintenance of optimum humus and nitrogen status of our soils, and also optimum moisture relationships. Cultivated crops are in general an unavoidable evil so far as conservation of soil is concerned. Continuous attempts have to be made to evolve better methods of rotation and soil management, including treatment with lime, manures and fertilisers so as to secure not only the optimum yields and quality of crops but also the conservation of soil fertility and soil structure.

### CONCLUSION

In conclusion of this article it is not out of place to mention that better farming is quite possible in this country, but not without the levelling up of the cultivators general and special education in improvements and modernized methods. The increased production of essential crops cannot be brought about by the antiquated processes or without a transformation of the mentality and character of the cultivators by the inspiring influences of education. This is, therefore, the crux of our agricultural problem. The cultivators must be awakened to the realities and demands of the present situation. His efficiency cannot increase under the deadening weight of gross ignorance. The farming industry stands to suffer, while its units are wedded to old, obsolete notions and practices.

*The raison d'etre of the Agricultural Departmtnt is to bring the message of new developments to the doors of the agriculturists.* But in this the Department has failed to justify itself. The distribution of stray packets of seeds or the display of novel implements and processes at exhibitions does not mean that a link of sympathy has been forged by the Department with the peasants. It is to be regretted that the distance between the two has not been to any practical purpose abridged. An officer of the department will not be worth his salt if he conducts himself in such a manner as not to be regarded by the cultivators as their guide and friend. There must be a spirit of comradeship between the two. And this cannot be an accomplished fact unless the officer thoroughly enters into the feeling of the ryot and carries on his work with the saving grace of sympathy. It is of the *utmost importance, therefore, that officer should be well acquainted* not o with the special conditions of Indian s and agriculture but also with the psych logy of the peasant's mind.

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## —PHARMACEUTICAL RECIPES

### TOOTH CAVITY FILLING

| | | |
|---|---|---|
| Zinc Oxide | 4 | dr. |
| Thymol Iodide | 5 | gr. |
| Creosote Oil | 10 | drops. |
| Clove Oil | 12 | " |

Lanolin, enough to make a solid paste.
Mix

### EYE ANTISEPTIC OINTMENT

| | | |
|---|---|---|
| Sulphanilamide | 10 | parts. |
| Sulphathiazole | 10 | " |
| Proflavin | 0.025 | part. |
| Distilled water | 5 | parts. |
| Anhydrous lanolin, enough to make | 100 | " |

Mix

### CHEST RUB SALVE

| | | |
|---|---|---|
| Petrolatum | 1 | lb. |
| Hard Paraffin | 1 | oz. |
| Eucalyptus Oil | 2 | fl. oz. |
| Menthol | 4 | dr. |
| Cassia Oil | 1 | " |
| Spirit Turpentine | 4 | " |

Melt the petrolatum and paraffin wax together in a double boiler and then add the menthol. Remove from the heat, stir, and cool a little; stir in the oils, add turpentine and the menthol. When it begins to thicken pour into tins and cover.

### SYRUP OF FERROUS PHOSPHATE WITH QUININE & STRYCHNINE (I.P.L.)

| | | |
|---|---|---|
| Iron filings | 8.6 | grams. |
| Phosphoric acid | 35 | cc. |
| Strychnine hydrochloride | 0.3 | grams. |
| Quinine hydrochloride | 13.3 | " |
| Dilute hydrochloric acid | 50.5 | c.c. |
| Simple syrup | 660.0 | " |
| Glycerin | 140 | " |
| Distilled water, sufficient to produce | 1000 | " |

Dilute the phosphoric acid with 70 c.c. of distilled water; add it to the iron filings in a flask of suitable size, and heat on a waterbath until the filings are dissolved; add to this a solution of strychnine hydrochloride and quinine hydrochloride in the 50 c.c. of dilute hydrochloric acid; filter it into the syrup and glycerin previously mixed and pass sufficient distilled water to produce the required volume.



### PURGATIVE

| | | |
|---|---|---|
| Kaldana, powdered | 1 | oz. |
| Rock Salt | | |
| Dried Ginger (Sonth) | 1 | dr. |

Mix. Dose: 1 dram with milk.



### PILES WITH CONSTIPATION

| | | |
|---|---|---|
| Chebulic myrobalans | 1 | dr. |
| Beleric myrobalans | 1 | " |
| Embelic myrobalans | 1 | " |
| Aniseed (Sonf) | 1 | " |
| Ginger (Sonth) | 1 | " |
| Senna leaves (Salsa) | ½ | " |
| Black salt | ½ | " |

Pulverize and mix.
Dose:—1 dr. in hot milk at bed time.

### BRONCHITIS PILLS

| | | |
|---|---|---|
| Cinnamon | 60 | grains. |
| Aniseed | 60 | " |
| Liquorice | 60 | " |
| Raisins, without stones | 180 | " |
| Sweet almonds | 60 | " |
| Bitter almonds | 60 | " |
| Sugar, refined | 60 | " |

Powder all drugs well and make into a pill mass with little water. Then make pills of 5 grains each.

### LIQUID EXTRACT OF BAEL

| | | |
|---|---|---|
| Bael, bruised | 1000 | grams. |
| Chloroform water | 15000 | c.c. |
| Alcohol, (90 p.c.) sufficient to produce | 1000 | " |

Macerate the bruised bael for 12 hours in 5000 c.c. of chloroform water; pour off and reserve the clear liquid; repeat the maceration a second and a third time for 4 hours in each case, using for each maceration 5000 c.c. of the chloroform water and strain the mixed liquids. Evaporate to 750 .c.c.; cool; add sufficient alcohol (90 p.c.) to produce the required volume. Set aside for 48 hours and filter.
Dose:—60 to 120 minims.

### LIQUID EXTRACT OF JAMBUL

| | | |
|---|---|---|
| Jambul stone, in coarse powder | 3000 | grams. |
| Alcohol | 2000 | c.c. |
| Water | 1000 | " |

Mix 1800 c.c. of alcohol with 900 c.c. of water, and having moistened the powder with with 1050 c.c. of the mixture pack it firmly in a cylindrical percolator, then add enough menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and, having closely covered the percolator, macerate for 48 hours. Then allow the percolation to proceed, gradually adding menstruum, using the same proportions of alcohol and water as before until the jambul is exhausted. Reserve the first 2550 c.c. of water.

Distil off the alcohol from the remainder by means of a waterbath, and evaporate the residue to a soft extract, dissolve this in the reserve portion, and add enough menstruum to make the fluid extract measure 3000 c.c.

### COMPACT ROUGE

| | | |
|---|---|---|
| Carmine No. 40 powder | 5 | parts. |
| Armenian bole | 35 | ,, |
| Maize starch | 130 | ,, |
| Precipitated chalk | 220 | ,, |
| Talc | 600 | ,, |
| Perfume compound | 10 | ,, |

Mix and sift through 200 mesh sieve. Triturate with about 25 per cent. of excipient which is made by dissolving dextrin or sugar in a small amount of water the mixture is finally compressed into tablet form.

---

### IMITATION GOLD

| | | |
|---|---|---|
| Copper | 90 | parts. |
| Gold | 2½ | ,, |
| Aluminium | 7½ | ,, |

Melt the copper and the gold in a crucible composed of refractory material or if a mixture of unburnt fire-clay and dust of fire bricks, glass pots or seggars, and when the metals are fluid the aluminium is added. When not more than 2 lbs. of the alloy are made at one time the mass is kept in a fused state for half an hour, about 4½ oz. of borax being added as a flux. The melted mass is then poured into ingots.

This alloy is used for making cheap imitation gold ware, resembling gold in colour and not tarnishing in the air.

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### SILVER PLATING POWDER

This is intended for use on brass and copper articles.

| | | |
|---|---|---|
| Chloride of silver | 1 | ounce. |
| Pearlash | 3 | ounces. |
| Common salt | 1½ | ,, |
| Whiting | 1 | ounce. |

These ingredients should be in as fine a powder as possible to reduce them and thoroughly mixed together.

The article to be silvered should be thoroughly cleaned and wiped dry. Then with a soft piece of leather, that has been dampened in water and dipped in the powder thoroughly rub the article to be plated so that every section receives an even coat. It should then be washed well in hot water and wiped dry.

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### CASHEWNUT TOFFEE

Take 2 lbs. sugar and 150 cashewnuts; skin the latter like almonds, in hot water, and chop up with a knife or mincing machine. Make a syrup of sugar with 2 tumblerfuls of water, then add nuts and cook till the whole crystallises; put into a filtered plate and when partly [illegible] cut into squares or diamond shapes.

### STAINLESS STEEL SOLDERING F

| | | | |
|---|---|---|---|
| (A) | Boric acid | 5 | pa |
| | Potassium fluoride | 5 | ,, |
| (B) | Hydrochloric acid | 5 | pa |
| | Distilled water | 5 | , |

Make a thin paste of (A) and (B) an to the joint.

---

### DOG SHAMPOO

| | | |
|---|---|---|
| Soft Soap | 8 | part |
| Glycerin | 2½ | ,, |
| Alcohol | 2 | ,, |
| Phenol | [illegible] | part |
| Eucalyptus oil | ¼ | ,, |
| Water to make | 35 | parts |

Dissolve the soft soap in the water by w ing. Then cool and mix the other ingredie

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### ANTI-PYORRHEA TOOTH POWDER

| | | |
|---|---|---|
| Calcium Glycerophosphate | 2 | parts. |
| Common salt (sodium chloride) | 2 | ,, |
| Animal charcoal | 1 | part. |

Grind each separately into fine powder mix.

---

### ADHESIVE FOR CELLOPHANE

| | | |
|---|---|---|
| Gum arabic | 16.5 | parts. |
| Glycerin | 29.5 | ,, |
| Water | 49.5 | ,, |
| Formaldehyde | 4.5 | ,, |

Dissolve the gum arabic in the water a mix the glycerin. Lastly add the formaldehy and bottle.

---

### BOILER COMPOUND

| | | |
|---|---|---|
| Soda ash | 87 | parts. |
| Trisodium phosphate | 10 | ,, |
| Starch | 1 | part. |
| Tannic acid | 2 | parts. |

Use powdered materials, mix well and the pass through a fine sieve.

---

### MOSQUITO REPELLING OIL

| | | |
|---|---|---|
| Cedar oil | 2 | fl. oz. |
| Citronella oil | 4 | fl. oz. |
| Spirits of Camphor | 8 | fl. oz. |

Mix in a dry bottle, and the oil is ready for use. This preparation may be smeared on the skin as often as is necessary to repel mosquito and other insects.

# —IN THE FIELD OF INVENTION

**NT PAPER PARACHUTE**

new, improved paper parachute is claimed ve many uses and to stand up under storage itions. According to a recent patent, paper he parachute is treated with 1 to 4½ parts ycerine in 100 parts of commercial alcohol. n the paper has been thoroughly saturated, s solution is removed and the alcohol is orated from the paper. Paper treated this reportedly may be folded and tightly packed torage without damage to it or cracking at folds.

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**LIZATION OF OIL MILL REFINERY WASTES**

The recovery of lecithins which are now g increasingly used in food technology is hasized. Lecithins can be recovered from mucilaginous matter mainly by centrifug-after floculation and removal of aqueous r—and may be subsequently further treated h acetone for removal of glycerides, fatty ls and possible impurities. Carotenoids, uring matters in the oils and fats are gene-y eliminated in the process and bleaching recovery is not possible except in palm oil. red palm oil (which is the name given to id fraction obtained on neutralizing palm represents about one-third of the original and contains unsaturated glycerides and t of the colouring matter. The recovery of otene from this fraction involves the prepa-on of methyl esters and subsequent (a) dis-ng under high vacuum (1/10 mm. Hg) at a perature of 130°—140°C. and recovering the otenoids by chromatography or (b) saponi-g at a temperature of 60°C. or below in a ogen atmosphere and treating the result-dry soap mass with petroleum ether, ace- or a chlorinated solvent. The latter (b) is improved method and limits the saponifica-to the coloured liquid part of the oil so t there is economy both of solvent and appa-us. The soap forms a useful byproduct—ium oleate—with 25-30 per cent. palmitate. carotene extracts should prove valuable in mal nutrition. They are odourless and taste- and sufficiently stable as they retain all the ural atioxidants of palm oil.

Sterols which form the greater part of the aponifiables of oils are a valuable source of hormones, vitamin D and other pharmaceu-l products. The sterol content varies wide-from O.3-0.4 per cent. in linseed or colza oils 3.5 per cent. in cotton seed oil, and over 7 cent. in some fish liver oils. The odorous stances in oils and fats removed in the super-ted steam treatment have a fairly high one content, e.g. methylmonylketone. These stances may be of value in perfumery.

—CHEMICAL AGE.

**NEW-RESIN-SAND MOULDING PROCESS**

A new resin-sand process for making foundry moulds and cores, described as "Croning", "C", or "Shell" process, developed in Germany during the war is now being tried on a pilot-plant scale in U.S.A. (C.T.J., 1950, 127, 1012). The process promises large savings and improvements over conventional sand moulding of cast iron and other metals and may become one of the biggest single uses for resins.

A mixture of 100 parts of dry sand and 8 parts of a thermosetting phenolic resin binder is placed on the hot metal pattern previously treated with a silicone resin as in greasing a cake pan. The pattern is built up to a thickness of ¼"—1", the excess resin-sand mixture is shaken off and used again. The pattern covered with a thin layer of the resin-sand mixture, about 3/16" thick, is heated in an oven for 1-5 min. until the resin is set, forming a thin shell over the pattern: the shell is then removed from the pattern. Cores to fill hollow spaces in the final products are made by blowing the resin-sand mixture with compressed air into a split-heated metal core box. The mould is embedded in a box of steel shot where it can receive the molten metal. The mould/surfaces are smooth and require little surface cleaning.

Sections as thin as 0.01" can be poured and tolerances of 0.002"—0.003" for small castings can be achieved with the process. Castings up to 100 lbs. have been produced. The method may prove very useful for mass production of identical and relatively small castings for automobiles, tractors and farm machinery. The volume of sand necessary for making moulds can be reduced by 90 per cent.: machining and cleaning costs are cut by 80 per cent.: improved working conditions result from the relative freedom from excessive dust and heat; more efficient handling of materials and better use of foundry floor space are claimed. Hardened moulds can be made ahead of time and stored until needed.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

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**IDENTIFICATION OF CLAYS**

A simple, rapid colour test for a qualitative estimation of clay composition in soils and rocks, and staining techniques that help to distinguish between clays that are harmful and those that are beneficial in agriculture and in construction work, have been developed at the U. S. Bureau of Reclamation. Denver.

The specimens for staining are extracted with a strong solution of hydrochloric acid and after heating and dry distillation the material is filtered and stained with saffranine. The stained specimens are examined under a microscope and the composition of the soil can be quickly determined by matching it with a comparison chart. Rapid field tests can be made by adding benzidine directly to untreated soils and rocks. Colour changes are observed within 5 min.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

**ZINC OINTMENT**

3126 P.G.S., Jullundur City—Wants to have a formula of zinc ointment.

| | | |
|---|---|---|
| Zinc oxide | 1 | oz. |
| Benzoated lard | 6 | " |

Mix in a mortar by rubbing and put in pots.

**CREAM OF TARTAR**

To prepare cream of tartar take crude tartar or argol deposited on the sides of the casks and vats during the fermentation of grape juice. Now dissolve the argol in hot water and treat it with a little pipeclay and animal charcoal, to remove the colouring matter derived from the wine. Filter the solution and set aside to crystallise.

**MILK TOFFEE**

| | | |
|---|---|---|
| Sweetened condensed milk | 3 | lbs. |
| Full cream milk | 1 | quart. |
| Sugar | 3½ | lbs. |
| Glucose | 4 | " |
| Butter | ¼ | lb. |

Vanilla and salt to flavour—sufficient.

Cook to crack all the ingredients together in an earthenware vessel of enamel except the last two. Then add the butter and vanilla essence. Pour the hot mass over a buttered marble slab. Lastly cut in cubes of required size and wrap in wax or cellophane paper.

**HAIR FIXATIVE**

3136 S.W., Madras—Wishes to have a good recipe of hair fixative.

| | | |
|---|---|---|
| (a) Distilled water | 700 | parts. |
| Glycerin | 30 | " |
| Borax, powdered | 25 | " |
| (b) Tincture of benzoin | 225 | " |
| (c) Perfume | 10 | " |

Make a solution (a), and add (b) with good stirring and a thin jet, add (c). Allow to stand for 3 to 5 days. Filter and bottle.

**REFINING PARAFFIN WAX**

To refine paraffin wax melt it over slow fire and digest it with 1/10 of its weight of animal charcoal in a liquid state. When the purification is complete, the paraffin is strained through linen and crystallised.

**CEMENT FOR GLASS**

3143 G.R.G., Kothapur—Wants to have a formula of preparing cement for glass.

| | | |
|---|---|---|
| Isinglass | 1 | oz. |
| Powdered glue | 1 | dr. |
| Distilled water | 2 | oz. |
| Salicylic acid | 10 | gr. |

Put the isinglass and glue in a gallipot add the salicylic acid and the water, pressing down the isinglass with a pestle until it is all soaked. Place gallipot in a saucepan of water, brin the boil, stirring until dissolved, then a[illegible]

| | | |
|---|---|---|
| Acetic acid (33 per cent.) | 1 | oz. |

Mix well, and pour into bottles.

**SULPHATE OF AMMONIA**

3151 M.B.L.S., Kanpur—Desires to kno process of manufacturing sulphate of amn[illegible]

In the manufacture of ammonium su[illegible] the ammoniacal liquor obtained in the [illegible] facture of coal gas is heated whereby the [illegible] nia gas is evolved. This gas is then ab[illegible] by passing through a heated mixture of g[illegible] and coke in equal proportions.

By this means the gypsum is converte[illegible] calcium carbonate and ammonia into amm[illegible] sulphate. The latter being soluble in wa[illegible] separated out from the insoluble calcium [illegible] nate by treating with water. The soluti[illegible] next evaporated to dryness so as to obtain [illegible] ammonium sulphate.

**MIRROR MAKING**

3156 O.P., Delhi—Desires to learn a met[illegible] of making mirror.

In making mirror two solutions are requ[illegible] ed namely reducing solution and silvering so[illegible] tion:—

Reducing Solution—In 1 oz. of dist[illegible] water dissolve 12 gr. of Rochelle salts, and [illegible] while boiling add 16 gr. of silver nitrate [illegible] solved in 1 oz. of distilled water and conti[illegible] boiling for 10 minutes more; then add [illegible] distilled water to make 12 oz.

Silvering Solution—Dissolve 1 oz. of s[illegible] nitrate in 10 oz. of distilled water, then [illegible] liquid ammonia until the brown precipita[illegible] nearly, but not quite, all dissolved, then add [illegible] oz. of alcohol and sufficient water to make 1[illegible]

To silver: Take equal parts of the [illegible] solutions and mix thoroughly, and lay the pla[illegible] face down, on top of the mixture while wet [illegible] it has been carefully cleaned with soda and [illegible] washed with clean water. About 2 dr. of [illegible] will silver a plate 2 inches square. The [illegible] in which the silvering is done should be only [illegible] little larger than the plate. The solution sho[illegible] stand and settle for 2 or 3 days before bei[illegible] used and will keep good for a long time.

**MASSAGE CREAM**

| | | |
|---|---|---|
| White wax | 4 | ounces. |
| Spermaceti | 4 | " |
| White petrolatum | 12 | " |
| Rose water | 14 | " |
| Borax | 80 | grains. |

Melt the wax, spermaceti, and petrolatu[illegible] together over a water bath; dissolve the bor[illegible] in the rose water and add to the melted mass [illegible] one time. Agitate violently. Presumably [illegible]

...ax solution should be of the same tempera... ...e as the melted mass.

## ...INEGAR FROM COCONUT JUICE

Take a measured quantity of coconut juice ...a suitable vessel. Add to it one thousandth ...art of its volume of honey. Place on the sur...ace traces of acetic acid ferment: leave the ...hole exposed to the air in a normal tempera...ure. The action now goes on regularly for 4 weeks or more, and sometimes later.

Make a separate powder to be mixed with ...he above:—

| | | |
|---|---|---|
| Alum | 3 | lbs. |
| Neutral tartrate of potassium | 5 | oz. |
| Chloride of ammonium | 7 | lbs. |

About 20 grains of this powder have to be ...issolved first with a little soft water and then ...nixed to each gallon of vinegar and filtered.

## ...OAP POWDER

3156 O.P., Delhi—Wishes to have a process ...f making soap powder.

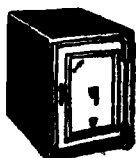
Soap powder is simply soda ash and soap ...ooled, and ground to a powder. Sodium sili...ate is also used as an ingredient. In prepar...ng the soap a little more water should be added ...han is used in finishing settled soap. Should ...he soap be finished too coarse the mixture of ...oap and soda-ash in the crutcher may be too ...ick for easy working.

Mixing and Framing: For this purpose ...no soap crutcher may be used, but it is desir...ble that for making the thick, heavy mass of ...oap and ash the mixer be more strongly built ...han the ordinary soap crutcher and preferably ...f the type with either horizontal or vertical ...lade agitator. The ingredients added to the ...ixer comprise thin soap, soda-ash and silicate ...f soda. These may be in various proportions ...ccording to the quality of powder desired. For ...single frame 600 to 700 pounds each of soap, ...nd ash may be used to which 100 to 125 pounds ...f silicate are added. Soap is run in first, the ...mount being determined by the level in the ...ixer, and then the ash in successive amounts ...ntil the entire weight is added. Addition of ...tire amount of ash at once may block the crut...her and bend or break the blades of the mixer. ...he amount of silicate added will depend upon ...e consistency of the mixture of soap and ash. ...the soap is finished too thin, the weight of ...h may not be sufficient to counteract the thin...ess of the resulting mixture, in which event ...ther more ash or less silicate may be added. ...hen a homogeneous mixture has been obtained the mass is framed. One day as a rule suffices for cooling, at the end of which time the mass is stripped and cut. Corners and ends of the frame are usually hard, to penetrate while the ordinary soap-slabber is unsatisfactory. Recourse is to be had to be cut by wire, it must be disintegrated by more laborious means. After slabbing is the most cleanly and convenient. According to the floor method, the mixed soap and soda-ash are run directly from the crutcher, used exclusively for this purpose, on to the floor of the apartment, where it is allowed to solidify. After this it is broken into coarse lumps to facilitate cooling and drying. The mass is then further disintegrated, and ground as required. The slabs after disintegration, either by hand or disintegrator, are ready for grinding.

## GLUCOSE

3176 P.K.K., Navsari—Desires to know the process of manufacturing glucose.

Liquid Glucose or Starch Syrup: To prepare it moist potato-starch, carefully purified from nitrogenous matter is employed. 200 parts by weight of water and as much sulphuric acid as serves to make a 0.3 per cent. solution are placed in a leadlined vessel, and 100 parts by weight of starch (weight dry) made into a milk with water are run into the boiling acid, so that the starch is almost immediately gelatinised. The mixture is then heated in a copper autoclave for one hour under 1 atmosphere pressure, so that about half of the starch is hydrolysed to dextrin and the rest to dextrose (or maltose). The process is finished when a portion gives no coloration with iodine—showing that all the starch has disappeared. The product is a non-crystallisable syrup having a density of 17°Be. The sulphuric acid is neutralised with calcium carbonate, the solution filtered from the calcium sulphate, through a filter-press, evaporated to 32°Be in a vacuum pan, again filtered from precipitated calcium sulphate, through a filter press, and finally decolourised by filtering through animal charcoal, which simultaneously absorbs some of the finer particles of calcium sulphate. The syrup is now again concentrated in vacuum pans to 40°—45°-Be and should be clear and colourless.

Solid Glucose: Solid glucose is manufactured in the same way as the syrup, but the hydrolysis in the autoclave is carried on for a longer time so that the resulting mixture contains almost twice as much dextrose as dextrin. The product, when filtered, decolorised and evaporated, solidifies as a white mass of

microscopic crystals, in which fine needles of dextrose hydrate may be seen embedded in syrup. The crystalline dextrose hydrate however, be separated by ordinary means from the syrup.

**ETCHING ON STEEL**

3192 S.B., Moradabad—Wants to have a process of etching steel.

Dissolve in 150 parts of vinegar sulphate of copper, 30 parts; alum 8 parts; kitchen salt, 11 parts. Add a few drops of nitric acid. According to whether this liquid is allowed to act a longer or shorter time, the steel may be engraved upon deeply or the surface may be given a very ornamental, frosted appearance.

**BRASSING IRON OR STEEL ARTICLES**

3203 K.L.D., Bombay—Wishes to have a simple process of brassing iron articles.

Acetate of copper, 100 parts, by weight; cyanide of potassium, 250 parts; bisulphite of soda, 200 parts; liquid ammonia 100 parts; protochloride of zinc, 80 parts; distilled water, 10,000 parts. Dissolve the cyanide of potassium and the bisulphite of soda. On the other hand, dissolve the ammonia in three-fourths of the water and the protochloride of zinc in the remaining water; next, mix the two solutions. This bath is excellent for brassing zinc and is used cold.

**BRONZE POWDER**

These are made in various ways:—

1. The alloy is laminated into very fine leaves with careful annealing, and these are levigated into impalpable powders along with a film of fine oil to prevent oxidation, and to favour the levigation.

2. The scraps, cuttings and fragments of Dutch leaf are the materials for the German bronze powders. First brushed through a sieve and ground with gum water on marble slabs for six hours, the gum washed out, the powders sorted, dried, and a coating of grease given to make them appear more brilliant, and to protect them from oxidation.

3. Brandi's Patent Process:—In making bronze powders they first take precipitated copper. It is allowed with zinc, cast into ingots rolled into ribands, cut, annealed, and rolled the metal in thin and leaf-like Then it is taken to a steam-mill and ground. The bronze powder is washed out and dried, then introduced into an air-tight room, with an arrangement of boxes; the air in the chamber is set in violent motion by bellows, and the powder diffused throughout; the bronze powders are deposi[ted] the finest in the upper boxes and the coa[rser] powders below.

**ARTIFICIAL STEEL SLATES**

3204 R.B., Lahore—Desires to know process of making artificial school slates.

The artificial slate coating on iron or st[eel] consists of a mixture of finely ground sl[ate] lampblack, and a water-glass solution of eq[ual] parts of carbonate of potash and soda silic[ate]. The process is as follows:—

First prepare the silicate solution by fin[ely] crushing equal parts of carbonate of potash a[nd] soda silicate and pouring over this 6 to 8 tin[es] the quantity of soft water, which is kept boil[ing] about 1½ hours whereby the silicate is complet[ely] dissolved. Add 7 parts finely crushed sl[ate] finely ground with a little water into impalpa[ble] dust, 1 part lampblack, which is ground with and grind enough of this mass with the previo[us]ly prepared silicate solution. With t[his] compound the rough form of steel plates a[re] painted as uniformly as possible. Keep as[ide] the painted plates for a week. Then put i[n] a saturated solution of calcium chloride a[nd] wash with clear water.

**RADIATOR COMPOUND**

3231 K.S.N., Bangalore—Wishes to ha[ve] formulas of radiator compound.

A 20 per cent solution of sodium silicate mixed with zinc dust and whiting (½ zinc dust whiting). This will take about 6 hours to s[et].

Moreover, to stop small leaks quickly p[ut] the white of 2 eggs in the radiator while t[he] water is cold. Another recipe of quick seal [for] radiator is as follows:—

| | | |
|---|---|---|
| Cellulose lacquer, colourless | 10 | parts |
| Aluminium filings | 3 | „ |

**COMPOUND SHELLAC**

60 per cent zinc-hardened Vinsol and 40 p[er] cent dry orange shellac by weight. The Vin[sol] is melted to 450°F. and 3 per cent of zinc oxi[de] on the weight of the Vinsol is sifted in and t[he] temperature gradually raised to 575°F., th[en] cooled to 400°F., at which point the shellac [is] added and when thoroughly blended the mix [is] poured into cooling pans. A 4-pound cut of t[his] blend behaves very much as pure shellac in t[he] majority of tests.

**BLACK INSULATING TAPE**

| | | |
|---|---|---|
| Resin | 20 | parts. |
| Resin oil | 20 | „ |
| Coal tar | 20 | „ |

| | | |
|---|---|---|
| Wood tar | 10 | parts. |
| Kerosene oil | 10 | „ |
| Linseed oil | 10 | „ |

Mix the ingredients over a moderate fire treat the tape with the composition.

**RACTION OF PEPPERMINT OIL**

3233 K.K.S., Guntur—Wishes to have a ss of extraction of peppermint oil.

Peppermint oil is obtained by distillation the fresh and sometimes partially dried, ring tops of different species of the Genus ha. The distilling apparatus consists of a len vat containing the herb, placed on an pan containing the water. Fire is applied, the steam passes through the herb and is ensed on an inverted cones. The distillate rried away to the receiver by a tube through side of the vat.

**ARIC ACID**

3256 K.D.S., Jaipur—Desires to learn a ss of manufacturing stearic acid and also nony trichloride.

Stearic acid can be prepared by Milly's clave Process. In this process the saponifin of fat is carried out by lime in presence ater in strong closed metallic vessels, at a erature of 172°C. One form of such vessel he saponification by lime under pressure has been much used is an egg-shaped der. The lime soap after its separation is nposed by sulphuric acid, four parts of acid ch three parts of lime used being taken. complete subsidence of the calcium sul- the free fatty acids are thoroughly washed water and steam. The crude fatty acids ext melted and run into dishes or trough of tin. These are placed in at room erature for 2 to 3 days to cool or until nts have granulated. The cakes are then n canvas bags and pressed to remove the acid.

After this the thin cakes of stearic acid is ned. This is known as single pressed ic. acid.

**IMONY TRICHLORIDE**

This salt may be prepared in the dry way ssing chlorine over excess of antimony, or eating together antimonious sulphate and m chloride, when sodium sulphate remains ntimonious chloride distils over. The salt also be obtained by dissolving either anti- or antimonious sulphide in strong hydro- ic acid, and distilling the rest.

**POLISH**

259 A., Bombay—Wants a good recipe of polish.

| | | |
|---|---|---|
| Shellac wax | 3 | lbs. |
| Bees wax | 1 | lb. |
| Hard paraffin | 2 | lbs. |
| Soft soap | 1 | lb. |
| Turpentine oil | 2½ | gallons. |
| Oil soluble dye | 1 | oz. |

Melt the wax over slow fire in capacious iron pan. Next add the soap and heat to dissolve. Then slowly stir in the turpentine oil and lastly dye dissolved in a little turpentine oil; when thoroughly mixed extinguish the fire but go on stirring until the mixture begins to thicken. At this stage pour in tins.

**NAPHTHALENE BALLS**

In order to produce napthalene balls the purified naphthalene is carefully melted at a low heat in an ordinary melting pot and ladled into the moulds with an iron ladle. Great care must be taken in melting the substance because at a high temperature it will ignite and burn causing a great loss to manufacturers. In casting, iron and wooden moulds are generally used. These are made in two halves connected together with pins; in each half a number of hemispherical depression are sunk in a line with a tube connecting them all together. At one end of the mould is a hole drilled for pouring in the melted mass. On cooling the liquid is solidified into balls, which may be separated by braking off the attached pipe.

**LUBRICATING GREASE**

3285 D.N., Delhi—Wants to have good formula of lubricating grease and also erasing rubber.

| | | |
|---|---|---|
| Petroleum jelly | 120 | parts. |
| Ceresine wax | 6 | „ |
| Slaked lime | ½ | part. |
| Water | 4½ | parts. |

Heat the wax and the petroleum jelly until liquid; then mix together the water and lime. Decant the former into packing receptacles, and add lime water, stirring until it sets. For cheaper qualities use cream cylinder oil instead of petroleum jelly.

**CHALK CRAYONS**

3291 S.H.R., Goregaon—Wishes to have recipes of chalk crayons.

| | | |
|---|---|---|
| Precipitated chalk | 40 | parts. |
| Plaster of Paris | 45 | „ |
| Lithopone | 10 | „ |
| Glue solution | 5.10 | „ |

Knead all together to make a soft dough and pour into gun metal moulds. When set take out and allow to dry in air. Then put all together in a tray and moderately bake over mild fire.

**[ Reader's business problems will be discussed in these pages. We invite the reader to w... us his difficulties. As the department is in charge of an experienced businessman who specially adept in dealing with such problems and to whom experiences of a large num... of successful businessmen are available, his replies will lead the enquirer to a succes... career. These replies will be published in the paper only and cannot be communicated ... post.]**

**OPENINGS FOR EDUCATED INDIAN LADIES**

235 R.L.D., Chinsurah writes—A girl of mine has passed the I.A. I am unable to provide for her further studies. The same reason operates strongly against her marriage as obviously I cannot give her away in marriage to one who is below her from an educational view point, and I have not the money necessary for her marriage with a bridegroom of high educational attainments. Though I am a Hindu, I do not observe the purdah. Can you tell me what arrangements I am to make for her future career?

Answer:—This is a very complex question, the solution whereof involves issues of social and economic nature. At any rate, we are glad that you have told us that, "although a Hindu, you do not observe the purdah." This has made matters somewhat easy for us. We fully appreciate and respect your unwillingness to marry your daughter to one who is below her from an educational viewpoint. It would no doubt have been eminently desirable if you could have managed to get her graduated. But if, as you haye said, the financial difficulties, of which you are the best judge, be really insuperable, then we are afraid there is no help in the matter. Why not ask your daughter to join one of the Insurance Companies as a canvasser? The prospects are ample, and a smart and educated lady, after some preliminary training as is usually imparted to their canvassers by at least some of the Insurance Companies, is sure to make a good income by her activities. Competition is almost unknown, as unlike males the number of ladies who have hitherto joined this line, is exceedingly limited. The work, besides, is not likely to be very hard in nature. Anyway, we feel sure that the Insurance Companies will only be very glad to respond to your queries if you enquire of them on your daughter's behalf as to whether or not there is any prospect for her if she chooses to sta... as a canvasser of Insurance Policies.

**POLICY FOR NEWCOMERS IN TRADE**

3106 M.V.N., Madras—I have started general store here very recently. Some of m... customers request me to sell goods on cre... But as I have a very small capital, I can... supply goods on credit. I shall be hi... obliged if you please advise me on this.

Considered from all points of view fo... one newly initiated in trade the best ma... to be followed would be to transact on a ca... basis. As he gets back money as soon as th... goods are sold and the capital invested is co... paratively small, he can afford to make le... profit and this can offer cheaper rates to ... constituents. Moreover, as he receives so ... is easily able to pay cash and thus secur... good discount from the house whence he ma... his purchases and this compensates for ... easy terms he quotes to his customers. Th... point is often not clearly understood by ... traders. Many are found to buy on credit ... if they have cash in hand or suitable reso... in banks. It often pays to borrow from a ban... to avail oneself of the discount he can enjo... by making ready payments. Suppose that th... monthly purchase is Rs. 1000 and the disco... available is 2½ per cent. then if he pays rea... cash he will get Rs. 25 as discount. Conside... ing that he borrows at 12 p. c. interest a ra... far too higher than at which it is availa... he has to pay Rs. 10 monthly and thus ... makes a clear profit or Rs. 15 per month w... no exertion but only with a little financ... calculation. Another important alvantage th... he scores over his competitor workin... credit system is that he has not to pay f... additional staff required for keeping ... accounts of the customers and taking rec... to litigation against the customers when the... fail to pay their dues.

## —BRIEF QUERIES AND REPLIES

...tions of any kind within the scope of Industry are invited. Enquiries or replies from our ...rts will be published free of charge in serial order. Questions are replied by post on receipt ...s. 8 stamps for each question. Subscribers outside India are requested to send two In...tional Reply Coupons for each question. In order to facilitate the work of Editor's Depart...t and to help prompt action the readers are requested to send enquiries in separate letters.

...1 S.N.M., Kanpur—We have no book on colour manufacture. An article on lead ...me manufacture appeared in February 1951 ...e of Industry.

...2 B.C., Comilla—For chemicals and dyes ...ire of Imperial Chemical Industries ...port) Ltd., Sardar Ghat Road, Chittagong.

...3 S.H.A., Jharwasa—Following is a list of ...eral dealers: All-India Minerals Association, ...Netaji Subhas Road; Bagri Mining Syndicate, ...Cross Road; Bengal Supply Co., 23, Strand ...d; Calcutta Mineral Supply Co. Ltd., 31, ...son Lane; East India Trading Co., 2, Church ...e and Free India Agencies, 1-2, Jackson ...e; all of Calcutta.

...4 N.C.I., Baroda—A formula of tambul ...r appeared in January 1951 issue and a ...ula of Mukhbilas appeared in February 1951 ...e of Industry. You may also consult Home ...stries published from this office, price ...3/7/-.

...5 T.K.S.R., Pondicherry--You may consult ...ber 1950 issue of Industry which may be ...to you on receipt of As. -/12/- postage stamp. ... not possible to remove upper coating of

...6 S.P.S., Chikati—The bluing of gun barrels ...fected by heating evenly in a muffle furnace ... the desired blue colour is raised, the barrel ...g first made clean and bright with emery ..., having no marks of grease or dirt upon ...metal when the bluing takes place, and then ...w to cool in the air. It requires considerable ...rience to obtain an ever clear blue.

...7 J.S.K., Delhi -You perhaps mean table ...which may be prepared as follows: To make ... salt dissolve lump rock salt in four times ...eight of water, filter and then drop into the ...red solution first chloride of barium and ...wards carbonate of soda as long as any ...ipitate falls. Then filter and evaporate the ...r fluid very slowly until crystals begin to ...ar. When this condition has been reached ...aside the solution for a day. The crystals ...aken out, dried and kept in bottles.

...8 R.C.C., Patna--Following is a recipe of ...able cod liver oil: Cod liver oil is extracted ... 90 per cent alcohol, filtered and the alcohol distilled off. Citric or tartaric acid 10 gr.; lemon oil 15 min.; syrup 4 oz.; codliver oil 4 oz.

9 P.V.R., Tanuku—For vermicelli and sago making machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

10 R.M.D., Bombay—For hosiery write to Ahmedabad Hosiery Factory, Ahmedabad; Fine Knitting Co. Ltd., Railwaypura, Ahmedabad; Karnatak Hosiery Works, Shahapur, Belgaum; Mehta Hosiery Works, Kachria Pole, Richey Road, Ahmedabad and Southern Knitting Works Ltd., Poona. Following is a list of hinge manufacturers: Abdul Kader Shamsuddin & Co., 41, Khoka Bazar, Bombay; Bombay Hinge Supplying Co., 66, Musjid Bunder Road, Matunga, Bombay; New India Hinge Supplying Co., 215-217, Samuel Street, Bombay and Purushottam Ramji Ltd., 12, Raja Woodmunt Street, Calcutta. Following is a list of nut and bolt manufacturers: Bolt Nut House, 71A, Netaji Subhas Road, Calcutta; Baroda Bolt & Engineering Co., Gaya Gate, Baroda; Ambica Bolt Nut Works, 100, Foras Road, Near Municipal Workshop, Bombay and Bharat Nut Bolts Industries Works, Udyognagar, Opp. King's Circle Station, Bombay 22.

11 M.S., Tadeppalligudem—We have no book on coal industry. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

12 M.R., Ramur—Process of manufacturing camphor tablets appeared in January 1951 issue of Industry.

13 M.R.W., Bombay—Process of manufacturing rubber balloons of required description will appear in due course.

14 G.P., Berhampur—Technique of printing business will be found in Printers Guide published by Oriental Printing Works, 18, Brindaban Basak Street, Calcutta.

15 G.M., Secunderabad—Following is a list of screw manufacturers: National Screw & Wire Products Factory, Belur, Howrah; British Screw & Bolt Works, 33, Narsingh Dutt Road, Howrah; Alliance Engineering Works, Santragachi,

*Howrah and Edward Miller & Co., 2e, Strand Road, Calcutta.*

*16 A.N.P.C., Coimbatore—For selling sarees you should advertise in local papers.*

*17 B.N.O., Rajkot—Refer your query to the International Institute, Aligarh.*

*18 K.V.S., Bangalore—For cleaning brass wire to a brilliant colour make a mixture of 1 part of common nitric acid and ½ part of sulphuric acid in a stone jar, having also ready a part of fresh water and a box of sawdust. The articles to be treated are dipped into the acid then removed into the water, and finally rubbed with sawdust. This immediately changes them to a brilliant colour.*

19 M.Y.K., Muzaffarnagar—You may take up agency business of foreign goods. But without any experience you will not be able to prosper in the line. It will be advisable for you to be an apprentice in a business house doing foreign agency business.

35 M.Z.Q., Etawah—You should use magnesium oxide and ethyl ether.

36 P.C.I., Travancore—For rubber you may enquire of the following firms: Periyar Rubber Co. Ltd., Thattakaad, Alwaye, Travancore, Portland Rubber Estates Ltd., Makut, Coorg; P. T. Thomas, Mundakayam, Travancore and P. V. Kuruvilla & Sons, Kothamangalam, Travancore.

37 G.T.C., Jaipur—No machine is available for splitting bamboo into thin sticks. You have to cut into thin sticks with sharp knife.

38 G.T.C., Nigeria—It is not possible to supply all the addresses you require. All the addresses will be found in Industry Year Book and Directory price Rs. 16/4/-.

39 R.R.I., Tanjore—We have no book dealing with forest product and indigenous herbs and drugs. You better enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

40 C.J., Calcutta—Following is a list of pencil manufacturers: Bhupati Pencil Factory, Post Box No. 52, Quilon, Travancore; F. N. Gooptu & Co., 12, Belliaghata Road, Calcutta; G. C. Law & Co., 2, Cornwallis Street, Calcutta; Hindusthan Pencil Ltd., 428, Kalbadevi Road, Bombay; Quilon Pencil Factory, Quilon; Star of India Pencil Factory, Washermanpet, Madras and Victory Pencil Co., Beach Road, Quilon. Process of manufacturing pencil will be found in Industry Prize Articles Vol. 1 published from this office, price Re. 1-14-0 including postage. There is no arrangement for giving practical training on pencil manufacture. You may start a pencil factory with Rs. 25,000 as initial capital.

41 B.S., Shillong—Refer your query regarding lac to the Director, Lac Research Institute, Nankum, Ranchi.



*42 S.G.Q., Calcutta—We have [illegible] dealing with glass industry. You [illegible] consult some book on glass manufacturing.*

*51 T.B.K., Fyzabad—Following [illegible] herb dealers: Bansidhar Dutt, [illegible] patty Street; Indian Herb Store, [illegible] Street; P. C. Dawn & Co., 1, Mechua [illegible] Madhusudan Chatterjee, 19, Mullick [illegible] P. K. Brothers, 46-1, Banstola Str[illegible] Calcutta.*

52 K.A.K., Bangalore—Following of snuff dealers: A. Jainalbedeen Sa[illegible] Mint Street, Madras: K. S. Sahib Snuff [illegible] 33-37, Muttu Naicken Street, G. T., Ma[illegible] Mugam & Co., 40, Old Jail Street, Mad[illegible] Shunmugam Snuff Co., P. O. Box 140, [illegible] Following is a list of tobacca me[illegible] Lakshmi Tobacco Export Co., Guntur, Tobacco Export Co., Kothapet, Gunt[illegible] Majeti & Aka, Guntur.

53 N.T., Ambala Cantt.—Following [illegible] of lubricating oil dealers: Anglo-Iranian [illegible] (India) Ltd., Hongkong House; Associat[illegible] Co., 6, Totee Lane; Burmah Shell Oil Sto[illegible] Distributing Co. of India Ltd., Hongkong [illegible] Dalhousie Square; C. C. Wakefield & Co[illegible] 7, Royal Exchange Place; Caltex Co[illegible] (India) Ltd., United Insurance Bldgs., [illegible] ranjan Avenue and Standard Vacuum O[illegible] 6, Church Lane; all of Calcutta. You consult Industry Year Book & Di[illegible] published from this office, price Rs. [illegible] including postage.

54 G.L.A., Rewa—Refer your query to Consul General for Norway, Imperial Chan[illegible] Wilson Road, Ballard Estate, Bombay.

55 R.P.G., Rewa—Following is a [illegible] bristle merchants: Khaitan Sons & C[illegible] Dalhousie Square East, Calcutta; Cawas[illegible] Sons, Opp. Anwarganj, Kanpur and Hind [illegible] Co., Mulberry House, Agra. For services match expert advertise in newspapers.

56 S.R.R., Shencottah—We have no [illegible] on toy manufacture. You may however en[illegible] of Thacker Spink & Co. (1933) Ltd., 3, Esple[illegible] East, Calcutta for the book on toy industry.

57 J.G.S.C., Delhi—Process of ma[illegible] peppermint, lemon extract and benzoin [illegible] appear in due course.

58 D.D.S., Bombay—Process of manufa[illegible] ing robbin compound and pasting gum [illegible] appear in due course.

59 B.Q.S., Patiala—We do not sell o[illegible] publications. For British Pharmaceutical C[illegible] enquire of Das Gupta & Co., 54-3, College St[illegible] Calcutta.

60 Z.H.S., Etawah—We have no elab[illegible] book on paint and varnish manufacture.

61 M.S., Ottapalam—For enamelled sh[illegible] enquire of the following firms: Bengal Ena[illegible] Works Ltd., 15, Old China Bazar Street, Calc[illegible] Sur Enamel & Stamping Works Ltd., 9, M[illegible] Road, Entally, Calcutta and Madras Enam[illegible] Works Ltd., 65, Sydenhams Road, Madras.

62 N.J.V.C., Murtazapur—Exhausted dr[illegible] cell has no use. You may separate the compo[illegible] nent parts and sell them in the market by advertising. Essential oils may be had o[illegible]

...oducts & Chemicals Ltd., Prospect ...Annexe, Bombay; B. C. Patel & Co., ...ess Stree', Bombay; Essence Supply ...6, Colootola Street, Calcutta and ...e & Sons, 3, Ezra Street, Calcutta. ...ay be had of Ciba (India) Ltd., Jehangir ...splanade Road, Fort, Bombay: Hansraj ... & Co., 2A, Armenian Street, Calcutta ...perial Chemical Industries (India) Ltd., ...and Road, Calcutta.

... G.E.R.S., Khanna Detailed process of ...facturing dry batteries will be found in ...facture of Batteries published from this ..., price Rs. 3/9/- including postage.

..4 V.Y.S., Bijapur Process of manufac...g white colour Emp-Resina B. P. will appear ...n early issue of Industry.

66 H.P., Aijal For waste paper write to Bhattacherjee, 31 2, Harrison Road and S. K. ...ha, 31-1B, Harrison Road; both of Calcutta. ... Swan ink and lead pencil enquire of ...ney Halder & Co., 11, Chittaranjan Avenue, ...utta.

67 R.N.V., Rohtak--For electric hunter ...te to General Electric Co. (India) Ltd., ...net House, Chittaranjan Avenue, Calcutta ... Balmer Lawrie & Co. Ltd., 103, Netaji ...bhas Road, Calcutta.

68 A.P.A., Bezwada -Process of manufac...ring Cinema carbon will appear in due course.

70 G.L.B., Raniganj- Bread making ...chines may be had of Small Machineries ...nufacturing Co., 22, R. G. Kar Road and ...ental Machinery Supplying Agency Ltd., P12, ...ssion Row Extension, both of Calcutta.

71 K.P., Ferozepur You may consult ...ome Industries published from this office, ...ice Rs. 3/7/- including postage. For elaborate ...ok on bread and biscuit manufacture enquire ... Thacker Spink & Co. (1933) Ltd., 3, Esplanade ...ast, Calcutta.

73 A.N.S., Chapra - Before manufacturing ...arda you may treat tobacco leaves with ...me-water

74 R.K.P., Gondia Your query is in the ...ature of an advertisement so this cannot be ...ublished in these columns.

75 R.B.V., Agra Hindi equivalent of the ...ngredients is not available.

76 O.N.A., Colombo An article on textile ...printing appeared in October 1950 issue of ...Industry.

77 J.V.R.S., Ambajipeta—Wood screw manufacturing machines may be had of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and T. E. Thomson & Co., 9, Esplanade East, Calcutta.

91 G.T.B.C.O.M., Amritsar--You may treat the soap stock with caustic soda for improving its colour. You may use oil expeller for extracting oil mud. You may consult Vegetable Oil Industries published from this office, price Rs. 3/7/- including postage. It is not possible to start glass industry with small capital.

92 R.M.P., Kampala—You should dissolve 12 grain sodium potassium tartrate in 12 oz. of distilled water.

93 S.S.R., Simla—Following is a list of confectioners: Sini Confectionery Works, Sini; Patna Confectionery Works, Gudri Bazar, Patna; National Confectionery Manufacturing Co., 301 Cr. of Grant Road, Bombay; Ghose & Mitra Confectionery, 110, Raja Dinendra Street, Calcutta; Bengal Confectionery Works, 98-3, Canning Street, Calcutta and U. P. Confectionery, 71/1, Canning Street, Calcutta. Following is a list of fire works manufacturers: Baba Fire Works, Surat; Bonbanniere, P. O. Box No. 10827, Calcutta; Dipali Fire Works, Konnagar, Hooghly; Kaka Fire Works Factory, Kurla Road, Andheri, Bombay and Orient Fire Works Co., 175B, Upper Circular Road, Calcutta. Following is a list of agarbati manufacturers: Mysore State Trading Agarbatti Co., 34-1, Ratu Sarkar Lane, Calcutta; M. K. Attar & Sons, Post Pachhapur, Belgaum; Mysore Anand Dhoop Factory, Kalamma Temple Road, Mysore; & Mysore Trading Agency, Basavangudi, Bangalore 4. Following is a list of fruit merchants: H. Fakir Mohamed Wazir Mohammad, 12, Ram Lochan Mullick Street; Golam Rabbani Mohamed Ayoob, 162, Harrison Road and Kishandas Kalidas, 12, Ramlochan Mullick Street, all of Calcutta. Following is a list of glass manufacturers: Balsukh Glass Works, 7, Swallow Lane; Calcutta Glass & Silicate Works, 9, Kundu Lane and Jayanti Glass Works Ltd., 8, Ezra Street: all of Calcutta. Exhaustive list will be found in Industry Year Book & Directory published from this office, price Rs. 16/4/- including postage.

94 D.V.V., Jamnagar—You should consult a handwriting expert. You may advertise in newspaper for securing services of a handwriting expert.

95 S.M.W., Ludhiana—For transfer labels enquire of Signograph Co., Baranagore, Calcutta.

96 N.P.D.P., Kalahandi — For wirenail and pin making machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

97 S.P.A., Alinagar—You may start oil extracting business with Rs. 20,000-. You have to invest Rs. 1 lakh for starting a glass factory. Plastic industry can be started with small capital.

98 N.G.P.P., Tuticorin -We have no book on brick and tile manufacture. You may how-

ever enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta for the book. For machine write to Martin Burn Ltd., 12, Mission Row, Calcutta.

99 J.K.L., Hubli—We have no book on taxidermy, hypnotism and novels. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East and W. Newman & Co. Ltd., 3, Old Court House Street; both of Calcutta.

100 K.S., Doiwala—Mantles after been knitted impregnated in impregnating solution, dried and then burnt in a burner.

101 G.T.C., Kanpur—Process of manufacturing naphthaline balls will appear in due course.

102 H.S.M.S., Alur—All the chemicals you require may be had of Calcutta Chemical Co. Ltd., 10 Bonfield Lane, Calcutta.

103 R.K.S., Ludhiana—We have no book on power loom. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East and Das Gupta & Co., 54-3, College Street; both of Calcutta.

104 M.L.B., Agra—We have no book on dry cleaning and laundry business. For laundry machine enquire of Jessop & Co., 93, Netaji Subhas Road, Calcutta.

105 S.J.M., Bilimora—We have no book on jewellery and ornament manufacture. For the book you may enquire of Hamilton & Co. Ltd., 8, Old Court House Street, Calcutta.

106 K.A.K., Bangalore—Process of manufacturing artificial beeswax will appear in due course.

107 S.S., Gaya—For soyabean enquire of Khadi Pratisthan, 15, College Square, Calcutta.

119 S.A., Kolar—For wool shearing machine write to W. H. Brady & Co., Ltd., Mercantile Bldg., Lall Bazar, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

120 K.M.D.C., Cuddapah—You have to take Drug Licence for manufacturing medicine and selling in the market. For particulars write to the Central Drugs Laboratory, Govt. of India, 110, Chittaranjan Avenue, Calcutta.

121 R.S.M., Ranchi—Following is a list of tanneries: Bengal Tannery Co., 31-14, Lower Chitpur Road, Calcutta; Modern European Tannery Ltd., 102, Topsia Rd. South, Calcutta; T. S. Tannery, 82, South Tangra Road, Calcutta; Patna Tannery, Paynental Garden Lane, Calcutta; Chrome Leather Co., Ltd., Chromepet, Madras; Tinnevelly Tanneries Ltd., Station Road, Sermadevi, S. I. Ry.; Cawr Tannery Ltd., Bhananapurwa, Kanpur; dusthan Tanneries Ltd., Jajmau Road, Ka and North West Tannery Co., Civil L Kanpur.

122 S.M., Bombay—We are not awa any firm that awards degrees of foreign un sities, such as London, New York and V ington.

123 L.S.R., Balasore—In order to re the defect of ink powder increase the po of dextrine to 3 oz. in place of 2 oz.

124 A.E.W., Nasik—Process of man turing red lead will appear in due course

125 S.J.K., Khurja City—Hand d cigarette making machine is not available. particulars of power-driven machine wri Small Machineries Mfg. Co., 22, R. G. Road, Calcutta.

126 J.P.A., Srinagar—For flour mill chineries and oil engines enquire of Ba Lawrie & Co. Ltd., 103, Netaji Subhas R T. E. Thomson & Co. Ltd., 9, Esplanade and Oriental Machinery Supplying Ag Ltd., P-12, Mission Row Extension; al Calcutta.

127 T.N.R., Patna—For calendar you write to the Imperial Tobacco Co. of I Ltd., Virginia House, 37, Chowringhee, Calc

128 E.R.S., Berhampur—Hydrogen ga not available in cylinders. You have to duce gas yourself by adding zinc to sulp acid. Balloons may be had of Swastik Ru Industries, Wardha, M. P.; Oriental Ru Factory, 52, Shri Krishna Niwas, Kalba Road, Bombay and Kundanmal Ramlal, 9 Bldg., 78-80, New Hanuman Lane, Bombay.

129 I.A., Bhuj—For supplying cutlery may negotiate with the following firms: A Nasiruddin, 60, Canning Street, Calc Mazumdar & Co., 113, Manohardas Ch Barabazar, Calcutta. S. H. Md. Ismail & S 58-8, Canning Street, Calcutta; Esoopally himbhoy, 205, Cutlery Bazar, Bombay and H. Abdul Karim, 215, Cutlery Bazar, Bomb

130 D.A.P., Badulla—For tyre retrea machine enquire of Kilburn & Co. Ltd., 4, F lie Place, Calcutta and Mother & Platt I Bruce Street, Fort, Bombay. For securing expert in tyre retreading advertise in ne papers.

132 B.M., Berhampur—All the chemi you require may be had of Calcutta Chem Co., Ltd., 10, Bonfield Lane and Allied Age 16, Bonfield Lane; both of Calcutta.

133 R.V., Dinapore Cantt.—Process of nufacturing pan mosala, agarbatty and da will appear in due course.

134 M.A., Patna—Envelope making manes may be had of Oriental Machinery Suping Agency Ltd., P12, Mission Row Exten. Calcutta. Lathe machines may be had Heroes Engineering Works, Ltd., 20, Paul eet, Calcutta.

136 A.G.A.B., Banaras City—Stationery l plastic goods may be had of Bengal Staters Syndicate, 1, Mission Row; City Staery Mart, 14-2, Old China Bazar Street, hi Bakhsh Bros & Co., 3, David Joseph ne; Jayantilal & Co., 55-131, Canning St.; lar Nath, 40A, Armenian Street and M. S. ned & Co. Ltd., 58-6, Canning Street; all of cutta.

137 S.B., Madras—For suitcase fittings ene of Patel Brothers, 34, Strand Road, and a's Hardware Emporium, 107, Chandney wk; both of Calcutta.

138 S.L.M., Meerut—We have no book on lloid manufacture. You may however enre of Thacker Spink & Co. (1933) Ltd., 3, lanade East, Calcutta and Standard Litera- Co. Ltd., 13-1, Old Court House Street, cutta.

144 S.M.A., Bahrain—You may consult ustry Year Book & Directory published from office, Price £1 6sh. including postage.

151 P.G.P., Bombay—Dip the garment in cleaning solution, rub thoroughly then dry iron. Radio receivers are not manufacd in India at present. Radio receivers are orted by the following firms: Phillips trical Co. (India) Ltd., 2, Heysham Road; C. Saha Ltd., 20D, Lindsay Street; R. C. & Sons, 161/1, Harrison Road; N. B. Sen Bros., 11, Esplanade East and C. C. Saha , 170, Dharamtala Street; all of Calcutta.

153 A.K.B., Allahabad—We have no orate book on calico printing. You may ever enquire of Thacker Spink & Co. 33), Ltd., 3, Esplanade East, Calcutta.

157 M.M.M., Lakhya—Replies of queries generally published free of charge in al order. Questions are replied by post on ipt of As. -/8/- stamps for each question.

158 S.N.R., Motihari—You may consult etable Oil Industry published from this e, price Rs. 3/7/- including postage. We e no book dealing with the process of nufacturing sugar from gur. You may te to the All India Village Industries Association, Maganwadi, Wardha, M.P. for a book on sugar making from gur.

161 R.K.M., Coimbatore — For rubber latex enquire of Mundakayam Valley Rubber Co., Ltd., Mundakayam, Travancore; P. T. Thomas, Mundakayam, Travancore and Murphy Estates Ltd., Mundakayam, Travancore. For chemicals enquire of Najmuddin Bros., Akbar Chambers, Mohamedali Road, Bombay 4.

162 C.R.R.T., Tellicherry—You may consult Manufacture of Confectionery published from this office, price Rs. 3/7/- including postage. Confectionery machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. We have no book on steel trunk manufacture. For machines enquire of Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta.

163 I.T., Meerut City—You have to secure Export Licence for exporting herbs and drugs from India. You may negotiate with the following firms for exporting herbs: William M. Allison & Co., 162, Water Street, New York; Asiatic Trading Co., 235, West 29th Street, New York; Iran American Trading Co., 505, Fifth Avenue, New York.

164 V.A.C., Kumbakonam—Following is a list of stick lac dealers: Jagadish Brothers, Dankingunj, Mirzapore; Garilo Ram Chedi Lall, Sabri Mirzapore and Gopaldas Kanhiya Lall, Muzaffarganj, Mirzapore.

165 L.B.T.C., Bombay—Surma is trisulphide of antimony purified by fusion and reduced to a black powder. The powder is used as an application to the eye lids and eyebrows. Detailed process of manufacturing surma will appear in usual course.

166 B.C.D., Gauhati — Process of mirror making appeared in April, 1950 issue of Industry.

168 U.S., Delhi—Process of manufacturing pencil will be found in Industry Prize Articles Vol. I published from the office, price Re. 1-15 including postage.

175 B.T.A., Gandhidham — Soda water making machhines may be had of Essence & Bottle Supply Agency, 14, Radha Bazar Street, Calcutta.

177 C.P., Gudivada—Process of tanning and coolouring leather will appear in due course.

178 K.T.C., Bombay—Following is a list of tin factories: Bengal Tin Box Mfg. Co. Ltd., 1, Jadunath Mitter Lane; Calcutta Tin Factory, 14/2, Nirod Behari Mullick Road; Colour

Printing & Hollowware Works Ltd., 243, Upper Circular Road; Dhur Tin Factory, 101, Aukshoy K. Mukherjee Road; all of Calcutta. For an exhaustive list consult Industry Year Book & Directory published from this office, price Rs. 16-4 including postage. Following is a list of Sugar Mills of S. India; Coimbatore Lakshmi Sugar Mills Ltd., Podanur; Etikoppaka Sugar Factory, Etikoppaka, Vizagapatam, Hospet Sugar Mills Ltd., Hospet, Bellary and Sri Rama Mills Ltd., Bobbili, Vizagapatam.

180 S.S., Colombo—For paper cups enquire of Bengal Cardboard Industries & Printers Ltd., 156, Cornwallis Street, Calcutta.

184 G.D.S.C., Kanauj Process of manufacturing aromatic chemicals will appear in due course.

185 E.P.P., Aurangabad For florentine orris enquire of F. N. Sirkar, 37, Canning St. Calcutta and Ghose Bros., 59, Ezra Street, Calcutta.

186 I.E., Agra—All the chemicals referred to by you are used in dyeing yarn and cloth and in printing cloth.

189 O.P., Delhi — Industrial diamonds, corundum and other hard stones are used for cutting glass.

192 A.M.F., Goa Process of making artificial cocoa butter will appear in due course.

193 D.R.M., Banaras For sewing thread enquire of Acme Thread Co., 37, Canning St. Calcutta. For reel winding machine enquire of W. H. Brady & Co., Ltd. Mercantile Bldg., Lall Bazar, Calcutta.

194 G.U.C., Madras You may start ink tablet manufacture, agarbatti manufacture and toothpowder manufacture on small scale.

195 P.P.R., Koraput Steel trunks and suitcases may be had of Arya Bhandar, 90-2A Harrison Road, Y.M.C.A. Bldgs.; Bengal Factory, 8, Broja Dulal Street; Modern Trunk Factory, 34, Harrison Road and National Trunk Mfg. Co., 12, Old China Bazar Street; all of Calcutta. For iron safes write to G. Pal & Co., 70-1, Netaji Subhas Road and Roy & Co., 100, Harrison Road; both of Calcutta.

197 G.L., Amritsar Following is a list of foreign trade commissioners in India: U. K. Senior Trade Commissioner in India, Eastern House, Mansingh Road, New Delhi; Senior Australian Govt. Trade Commissioner in India, Menkia Bldg., 10, Outram Road, Bombay 1; American Trade Commissioner, 9-10, Esplanade Mansion, Calcutta and French Trade Commissioner, 13, Park Mansions, Park Street, Calcutta. Wants to be put in touch with the suppliers of white sheet for manufacturing hinges.

200 P.W.M., Banhatti—We have no such book. You may write to Manager of Publications, Civil Lines, New Delhi for Govt. of India publications.

202 R.K., Shillong You may consult Cow Keeping in India by Isa Tweed to be had of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

203 G.F.R.S., Khanna—You may consult Manufacture of Batteries published from this office, price Rs. 3/7/- including postage.

204 U.H.N., Chaibasa—We are not aware of the address of the agent of the firm referred to by you. You better write to American Trade Commissioner, 9-10, Esplanade Mansion, Calcutta.

205 B.N.S.V., New Delhi—Following is a list of herb dealers Bansidhar Dutt, 12, Khengraputty Street, Calcutta; Indian Herb Store, 31, Mullick Street, Calcutta; P. C. Das & Co., 1, Mechua Bazar Street, Calcutta; Himalaya Stores, Kasauli Hills, E. Punjab and Khaitan Sons & Co., 2, Dalhousie Square East, Calcutta.

207 S.A.A., Sukkur You may consult Home Industries and Prospective Industries; both the books published from this office are priced Rs. 3/7/- each including postage.

211 R.B., Aijal — For fruit preserving apparatus write to Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension and Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, both of Calcutta.

212 L.F.T.C., Bareilly Process of deodorising and refining mixed oil will be found in March, 1951, issue of Industry. It is not possible to manufacture coaltar on small scale.

213 A.P.A., Bezwada Process of manufacturing cinema carbon will appear in an early issue.

214 D.B.G., Bombay Amyl acetate and acetone are used for making tubes from celluloid film. Celluloid bangles are in demand throughout India.

217 S.S.M.C., Madras Process of tin printing will appear in due course.

**MODERN AGE AND INDIA. Edited by A. BOSE, M.A., Ph.D. Published by Leftist ok Club, 186, Bowbazar Street Calcutta 12. ges 26j. price Rs. 6/-.**

The book under review marks off the e for economic and political experimenta- n in various countries and India down from eventeenth century to the present day. e book is a collection of articles by eminent holars on twenty subjects, e.g., Spirit of the odern Age, First Revolutions, French Revolu- n, Industrial Revolution, Russian Revolu- n, Colonial Revolution, Political Ideologies, pitalism, Socialism, India's Struggle For eedom, India's Economic Problems, etc.. The book thus presents an intelligent, st lucid, account of the main currents of social and political ideologies now occupy- human mind all over the world. The book s with a number of chapters dwelling on evolving constitutionalism in India with account of the political programme of differ- t political parties working in India for India's litical and economic uplift.

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**PLANNING FOR THE INDIA'S MAN WER by Uma Charan Patnaik, M.A., B.L., L.A. (Orissa), Advocate, Orissa High Court.**

The book under review is in fact a memo- ndum submitted by the author to the vernment of India with relation to planning India's man power. The author believes t social and economic freedom for teeming lions of India can only be achieved by a nned mobilisation of India's vast manpower all out and all-round development drive. The k envisages a comprehensive scheme for the ganisation of India's human resources. The hor strongly urges the co-ordination of the on-building and defence departments and utilisation of defence machinery for produc- e and constructive purposes. Here is an ect which has not received adequate atten- n in this country. The Civil and Defence ouncil in addition to the Centre and the tes have to work in unison from top to tom at every level for this purpose. The eme essentially means that the task of arting education, training in aviation, ustries, trades and agriculture have to be rusted with the top-heavy Defence Depart- nt and that suitable provision has to be made the demobilised persons to help in the ntry's development drive and to maintain mselves without a pension through trades, ustries and agriculture. The major part of book is devoted with this aspect of planning ough references have been made to develop- nt of agriculture, industries etc. for the terment of the lot of the Indian people. The morandum is thought-provoking and deserves usal. The suggestions, if followed, will lead most desirable results but it does not strike t the Defence Department, as it is now stituted, is quite competent to take up the responsibilities to be thrust upon it. It will however be advisable to give the scheme a fair trial by accepting such suggestions which are capable of being put to practice immediately.

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**BENGAL FAMINE by Tarak Chandra Das, M.A. Published by University of Calcutta, Darbhanga Bldgs., Calcutta. Pages 154, price Rs. 6/-.**

It may not be known to many that the victims of the Bengal Famine of 1943 far out-numbered the victims of the battle-fields of the last Great War. Destitutes thronged in thousands in Calcuta for a morsel of food. and died on the pavements unknown and unmourn-ed. More than 97 per cent. of them were inhabitants of West Bengal and mostly derived from the lower strata of both Hindu and Muhammaden society. The socio-economic condition of these people formed the subject of a study by the Department of Anthropology of the University of Calcutta. The book under review traces the causes leading to the influx of the destitutes into Calcutta in 1943 and a pen picture of the life they led there. The book aims at supplying data about their main occupations, assets, indebtedness, social disinte-gration, etc. There is a full chapter analysing the general causes of the famine which have been classified under two broad divisions, viz.; basic and immediate causes. The principal basic causes are stated to be: Insufficiency of the staple food-grains produced in the province for its population, smallness and scatteredness of agriculture holdings, smallness of margin between subsistenace and starvation of the Bengalees connected with land, extension of the cultivation of jute at the cost of food-grains, physical degeneration of the people produced by malnutrition and malaria. Among the immediate causes of the famine are natural calamities like flood, and cyclone in some parts of the province, hoarding of rice by farmers, merchants and well-to-do consumers, ineffec-tive price-control by the Government of Bengal, denial policy, dislocation of transportation. inflation of currency, official corruption, etc. There is also a test survey of famine condition in Bengal villages from November 1943 to March 1944. A large number of illustrations and charts enhance the value of the book.

**CONGRESS PUBLICATIONS**

The following publications of the All-India Congress Committee, 7, Jantar Mantar Road, New Delhi have been received in our office:—

(1) **Third Year of Independence,** August 1949-August 1950, pages 119, price Re. 1-8-0.

This volume records the general progress made in the affairs of the State by the Central and Provincial Grovernments and presents an account of the economic progress during the year on various subjects as Budget, Education, Public Health, Local Self-Government, Transport and Communications, Labour, Rehabilitation, etc.

(2) **Chief Ministers Speak,** pages 241, price Rs. 2-8.

This volume coming from the pen of Chief Ministers of the States in India, gives authoritative versions of the work achieved in various spheres in the States.

Both the books are fully illustrated.

**CHITTARANJAN SPECIAL**

The establishment of the Chittaranjan Locomotive Works will constitute a landmark in the development of Railway enterprise by the State in this country. The workshop will enable India to become self-sufficient in regard to all that appertains to our Railways. The project deserves to be more widely and properly appreciated. The East Indian Railway Magazine is therefore to be congratulated upon publishing a Chittaranjan Supplement which contains all particulars about how the Locoworks were started, how it was developing and what it would do. The Supplement is fully illustrated and will serve the purpose it was intended for. Price Rs. 3/-. It may be had at Fairlie Place, Calcutta.

**A BOOK ON DOLLAR-RUPEE CALCULATION**

We have received a copy of book entitled, Dollar-Rupee Exchange Calculator, by R. N. Sanyal. It contains useful tables of converting dollar into rupee and rupee into dollar at the discount, commission and interest tables. The present rate of exchange furnished with the book will be helpful to businessmen who have transactions with U. S. A. It is published by Messrs Sanyal & Co., 1/1A, College Square, Calcutta 12. Its price is Rs. 9/-.

**THE EASTERN ECONOMIST**

We have pleasure in receiving a copy of the annual number 1950 of the Eastern Economist published by the Eastern Economist Ltd., New Delhi. The annual number is broadly divided into two sections viz: (1) Analysis of India's economic life in relation to other countries in the World, and (2) the Nation's Economic System in 1950. The first section shows where India stands in the national income scale, how her agricultural production compares with that of other countries, how the industrial structure is undergoing changes under pressure of World events and ends with a political epilogue. The second part surveys the Indian position in 1950 as far as Indian agriculture, trades, industries, stocks and shares, banking, etc. were co[illegible] There are a large number of chart[illegible] plain and coloured, illustrating the bal[illegible] trade, direction of trade etc. The articles [illegible]ed in this Number are interesting in their [illegible] and are marked with a refreshing outl[illegible] the future of the country. We wish the N[illegible] wide publicity. This particular Num[illegible] priced at Rs. 5/-.

# NOTICES & REVIE[illegible]

**(Manufacturers sending specimens [illegible] samples of their products for notice and r[illegible] may please note that no notice is publish[illegible] medical preparation and allied substanc[illegible] this section).**

**CALENDARS**

We acknowledge with thanks the recei[illegible] calendars from the following:—

Standard Vacuum Oil Co., 6, Church L[illegible] Calcutta; P. K. Sen's Drugs & Chemical W[illegible] 105/1, Ultadanga Main Road, Calcutta; Scien[illegible] Publishing Co., 85, Netaji Subhas Road, Calcu[illegible] Titaghur Paper Mills Co. Ltd., Chartered B[illegible] Bldgs., Netaji Subhas Road, Calcutta; K. Brothers, 2649-2650, Jumma Masjid, Ahmedal[illegible]

**BRITISH INDUSTRIES FAIR**

We have received a copy of the Th[illegible] Survey of British Industries Fair to be held [illegible] London and Birmingham simultaneously [illegible]tween April 30 to May 11, 1951. A special sig[illegible]ficance attaches to this year's Fair as it coincid[illegible] with the festival celebrating the centenary [illegible] the Great Exhibition of 1851. This issue show[illegible] how virtually every industry has been tran[illegible]formed beyond recognition during the centur[illegible] Industries discussed in this number are Chem[illegible]cals, Scientific Instruments, Glass and Ceramic[illegible] Toys, Sporting Goods, Hardware, etc.

# TRADE ENQUIRIES

**(To communicate with any party write to him direct with name and address given below mentioning Industry).**

69 N. Pattabirama Chettiar, Karur, S. I. Ry.—Wants to be put in touch with the suppliers of white cotton waste.

72 The Eagle Advertising Tape Factory, Eagle Wadi Kurla, Bombay—Want to be put in touch with the manufacturers of gummed paper tape roll of different sizes.

145 Ram Singh, C/o. New Bharat & Co., Eagle Wadi, Kurla, Bombay—Want to be put in touch with the manufacturers of celluloid plastic sheets.

193 Des Raj Madan, Guru Bagh, Banaras—Wants to be put in touch with the manufacturers of foot rules of wood and plastic.

199 Sachida Nand, C/o. Shri Prem Nath Sahib, Advocate, Ferozepore City—Wants to be put in touch with the suppliers of tea tablets.

261 B.R., Tibarewala, P. O. Ratan Nagar, Bikaner—Wants to be put in touch with dealers in captish teeta.

Edited, Printed & Published by K. N. Banerjee, for Industry Publishers Ltd.. at the "*INDUSTRY PRESS*," 22 R G Kar Road Calcutta – 4

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*A Monthly Magazine for Manufacturers and Businessmen.*

Published in the first week of the month by
INDUSTRY PUBLISHERS LTD.,
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## EDITORIAL CONTENTS FOR MAY, 1951



## BUSINESS NOTICE.

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

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### OFFICE HOURS.

Editorial Department — 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays.

Subscription and Advertisement Department 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

# —CLASSIFIED BARGAINS

[ADVE]RTISEMENTS under this head of small announcements cost 4 As. per word, minimum [...] payable by Postage Stamp or M.O. with order. No vouchers given.
[R]eaders—In writing to advertisers the Readers are requested to write legibly and quote [...] they are writing in response to advertisement in INDUSTRY. This would ensure prompt [atte]ntion. Letters to Advt. No. should be duly stamped.

**LIST OF CLASSIFICATIONS**



## AGENTS WANTED

**For Calendars, Diaries, Handbags, Purses,** [a]nd Gloves, Apply Bengal Leather Industries, [...] St., James Square, Calcutta 67 AA

**Hooparin for Cough, Cold Whooping** [...] and Asthma. Madhav & Co., Jorasan[ko], Calcutta 7. 66 AA

**Bangaluxmi Leather Works, 10/B, St., James** [Sq]uare, Calcutta—Wanted Stockists for money [pu]rses and Ladies Hand Bags. 63 AA

**Fountain Pen Rubber Tubes our own make.** [...] Emersons (India) C-94. Rajindernagar, [N]ew Delhi 296 AA

**Wanted Agents for Studs & Buttons. Indian** [...] Traders, 9, Matilal Mitra Lane, Cal.—11. 322 AA

**D. D. Malam—A Soothing Ointment for all** [sk]in Diseases, never stains on clothes. Wanted [Ag]ents, Mahatma & Co., Jorasanko, Calcutta 7. 80 AA

**Wanted Agents to Earn 500/- Monthly** [w]orking for Embossers, Nameplates, Locks & [...]nning machines Apply International Industries [Lt]d., Aligarh. 69 AA

**For "Organisers and Agents" on suitable** [te]rms, apply Oriental Provident Insurance Ltd. [...], Canning Street, Calcutta. Phone Cal. 7175. 76 AA

**Wanted Travelling Agents for Jessore Horn** [B]uttons, Plastic Combs, Haircilps and Bangles, [Sa]mples Rs. 6, for each full set, refundable. [La]xminarayan Comb Factory, P. O. Box No. [2]426, Calcutta. 268 AA

## AGENTS WANTED.

**"Wanted Agent for Aligarh Locks retail or** wholesale work, Diwan & Co. Tamolipara Aligarh." 365 AA

**Wanted Agents for booking orders for silk** and cotton carpets. Apply to:—Parasakthi & Co., Post Box No. 13, Bhavani. (Via) Erode, S. I. Ry. 333 AA

**Wanted Agents & Wholesale Customer for** our Horn Buttons and Combs etc. National Button Industries, 27, Mechua Bazar St., Cal. 7. 318 AA

**"Wanted bonafide Agents throughout India** for foreign fabrics. Relevant persons only need apply Sole representative Post Box 6481 Bombay 16." 371 AA

**Free Prizes Rs. 3000/- and Radio (part-**time work). Contact Hitkarak, Post Box 410, [Ka]npur. 146 AA

**"Wanted Agents for all kinds of Buttons,** Sewing thread balls, and other tailoring materials. Industrial Distributors P.O. Box No. 2505 Karol Bagh, New Delhi 5. 152 AA

**"Wanted Inspectors and Agents on salary** and commission for selling our newly floated shares permitted by Central Government. The Peerless Life Assurance Co., Ltd., 35, Chittaranjan Avenue, Calcutta." 35 AA

**"Wanted Agents throughout India for** Quality Pharmaceutical Products manufactured under Drug Control Rules. For details contact Chandulal Nanavati & Co. 233, Laxmisadan, Thakurdwar Road, Bombay 2." 366 AA

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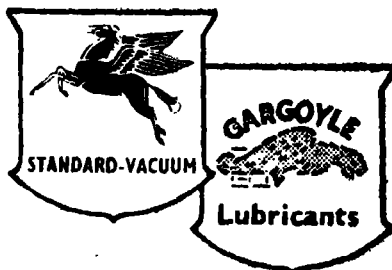
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# Industry

EDITOR

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## POPULATION AND FOOD

THE provisional figures of the 1951 Census just released by the Census Commissioner reveal a lot of interesting facts which need be taken into consideration in planning for the Indian Union as a whole.

The memorandum shows that the total population of the Indian Union, excluding for the time being that of Jammu and Kashmir, stands at 35.68 crores as against 31.48 crores in 1941 in the same territories now covered by the Indian Union. The population thus records a rise by 4.20 crores or 13.4 per cent over that of 1941. If to this we add the population of Jammu and Kashmir which aggregates 43 lakhs on March 1, 1950, the total population reaches the figure of 36.98 crores. The density of population thus comes to no less than 296 per square mile which compares with 123 in China, 23 in U. S. S. R., 50 in U. S. A., 135 in European countries, 210 in Pakistan, etc.

That there has been alarming rise in the population of the Indian Union will be evident from the fact that while during the decade 1921-31 the population rose by 27 lakhs annually, this rose by 39 lakhs annually during the decade 1931-41 and by 46 lakhs annually during the period covered by the present Census.

The population figures reveal that with 2.4 per cent of total world area and 15.1 per cent of total world population, India has a per capita of only 0.70 acre of agricultural areas and 0.24 acre of forest and woodlands. Taking into account the fact as asserted by the U. N. Secretariat which recently investigated about the food grains requirement of the world that 2.5 acres of cultivated land is necessary to feed a single human being throughout the year, hopes of attainment of food sufficiency in India become remote and there is great apprehension that a permanent shortage of food will continue in India unless efforts are now made to make scientific use of all available lands and introduce better system of cultivation with better seeds and manures. The problem of food supply in India is a very urgent one and must be faced with foresight and imagination. She cannot depend indefinitely on foreign imports, specially because the world population being on the increase at the rate of 70,000 a day, the chances of securing good stuff from foreign lands are also narrowing down.

**GLASS INDUSTRY IN INDIA**

The problems of the glass industry in India came up recently for a comprehensive review before the Planning Commission. It is stated that there are in all in operation 101 factories of all types of glass and glassware (excluding sheet glass and bangles) and their installed capacity is about 1,83,440 tons. Adding to this a capacity of about 28,000 tons for 33 units which have suspended production during the past two years, the total installed capacity comes to about 2,11,440 tons per annum. The sheet glass section consist of three units with a total installed capacity of about 23.4 million square feet. Besides, there are, about 100 factories of varying sizes, mostly on a cottage industry basis engaged in the manufacture of bangles.

It is understood that the production of glass and glassware (other than sheet glass and bangles) had been steadily increasing from about 66,000 tons in 1948 to about 81,000 tons in 1950. The sheet glass section, which had reached a peak production of 13 million square feet in 1944-45, suffered a setback during 1949, owing to excessive imports during the two preceding years. But, in 1950, there would appear to have been a recovery to 9.57 million sq. ft., approximately equivalent to 5,000 tons. The value of the current consumption of all types of glass and glassware is estimated to be over Rs. 10 crores, of which the indigenous production accounts for about Rs. 8 crores.

Improvement in quality depends on proper processing of sand. It has been most important raw material. It was accordingly suggested that all large factories should establish sand-washing plants, while small ones should combine and erect central washing plants at important centres from which sand might be ob[illegible] ed. Sand from Travancore is s[illegible] be of very good quality needing no[illegible] ing and offering easy transport by manufacturing centres in Bombay. manufacturers are also advised to t[illegible] advantage of the testing and [illegible] facilities offered by the Central Gl[illegible] Ceramic Research Institute at Calc[illegible] sending samples of raw materia[illegible] finished products to the Institu[illegible] examination. The need for a[illegible] wastage of coal to reduce cost al[illegible] been emphasised.

At present, only three glass fac[illegible] are stated to have been equipped, automatic machinery, the others m[illegible] ing mostly with semi-automatic mac[illegible] It was pointed out that caution was n[illegible] ed in regard to the introduction of a[illegible] matic machines, because the market [illegible] country for mass-produced goods [illegible] automatic machines was limited and [illegible] pace of standardisation was slow. It [illegible] however, emphasised that there [illegible] definite advantages to be secured [illegible] automatic machines, such as unifo[illegible] and economy in raw material consum[illegible] Only one of the firms engaged in m[illegible] facturing neutral glass was stated to h[illegible] installed tube-drawing and auto[illegible] ampule-making machines. A scheme [illegible] manufacturing neutral glass in collab[illegible] tion with an American firm has al[illegible] been approved by the Government.

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**INDUSTRIAL FINANCE CORPORATION**

The working of the Industrial Fi[illegible] ance Corporation was recently discu[illegible] before the Rotarians. The Industrial Fi[illegible] ance Corporation in India established [illegible] 1948, for rapid industrial reconstructio[illegible] and development is a new experimen[illegible] it is therefore regretable that in th[illegible]

y, the Corporation has been ex- prohibited from subscrib- rectly to the shares or stock of any limited liability company. Such is calculated to restrict considerably cope and serviceability of the Cor- on and to prevent it from pursuing methods of finance. What is tly required is not provision of mere capital but "risk" or "enterpreneur" l. The Corporation is not a bank. st be prepared to take much greater han a commercial bank, if it really to assist in rapid industrialisation country, especially at a time when e capital is not coming forward gh the formation of joint-stock anies.

he loans advanced by the Corpora- have generally been made for a period years and sometimes for 15 years against the first mortagages of the assets of the companies like land, ing plant and machinery. As a rule no nces are granted against hypotheticu- of stocks of raw materials and finished s for working capital. It is consider- at if the I.F.C. extends the period of oan to 20 years or more it will be a help to its borrowing customers. ially those that require several for development and earning of

urther in making advances the Cor- ion should have adequate evidence the loans are being used for the pur- for which these are granted. It is ested that under the Corporation a al technical investigation department sting of engineers, building experts, accountants etc. should be set up in to act in close liaison with the bor- ng concerns and not only to carry on dical investigation into the working e concerns and give timely warning e Corporation when symptoms of danger are discerned, but also to make available to the customers the benefit of their expert advice.

Another serious defect in the Corporation is the absence of a department of economic research. It is high time that the Corporation appoints an economic adviser or director of economic research and takes steps to constitute an economic intelligence section.

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**WEST BENGAL INDUSTRIES**

It is understood that the scheme for manufacture of penicillin under the auspices of the West Bengal Government will be finalised soon and technical personnel for the purpose is expected to arrive early.

As to manufacture of DDT and false plastic teeth in West Bengal, the State has to get a permit from the Government of India in respect of the former and orders have already been placed with a Swiss firm for machinery in respect of the latter. The machinery is expected to arrive soon. The manufacture of DDT alone will be shared with private enterprise.

Setting up a factory for manufacturing of salt on Contai sea-coast and execution of a number of electrification schemes are also under Government's contemplation. Of these North Calcutta Electrification Scheme has already been in progress.

Besides these, Government are running certain production units for the expansion and development of such cottage industries as khadi, silk, handloom weaving, handmade paper and ceramics. Government it is understood, has however no intention of acquiring any existing trade or industry in the State.

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**ELECTRIC FANS**

At present there are about thirty factories in India manufacturing electric

fans on an organised basis. The total capacity is 310,800 fans a year. Calcutta and the industrial suburbs have the largest concentration of fan-making units in the whole of India. As many as 17 factories are situated in West Bengal turning out over 68 per cent. of India's total production of fans. The present annual demand for ceiling and table fans is estimated to be 140,000 and 60,000 respectively. The demand is in fact flexible and increasing every year with the improvement in the standard of living and with the increase in the area electrified and the number of new towns and cities.

In view of the decision of the Government to fit class III passenger coaches with electric fans, the demand for railway carriage fans is showing a rise. While the present demand for this kind of fans is estimated normally at 12,000 a year, it is quite possible that it will double or treble itself within the next two or three years. There are at present at least eight firms manufacturing on an average 1000 carriage fans a month.

It may be of some interest to note that the ratio between the cost of indigenous raw material and components and that of imported stuff is forty to sixty. This means that the bulk of the raw material is indigenous. Until two years ago we had to depend on imports for the supply of electrical steel sheets. To-day the electrical steel sheets of the dynamo grade produced in India are more than sufficient to meet the requirements of the fan industry.

In manufacturing ceiling fans the Indian industry is setting new standards of efficiency. Efforts are now being made to perfect the oscillating mechanism in a table fan which the industry had not yet been able to manufacture satisfactorily. The fan industry is still dependent on imports of enamelled wire and materials and to a certain exte requirements of high class p varnishes.

It is encouraging that despite cuties the Indian Fan manu industry has shown efficiency in ing an ever-rising curve of pr which may reach a level of ex surplus of its ability to neigl countries in the near future.

**DEVELOPMENT SCHEMES IN PAKIS**

The development schemes in P for the year 1951-52 were envisa the Budget Speech of the Finance ter of Pakistan.

It is said that the six-year d ment plan of Pakistan represents th endeavour to improve the ec objectives of the country and account of its basic requirements. economic council, with full powers plement the plan, and Planning Co sion with sub-commissions have be up. Expert advice has been obtaine some of the projects included in th have been examined by the experts of International Bank which has exp readiness to negotiate loans for Pak and to meet the requirements of exte finance to the tune of sixty million d

One of the fields in which there been considerable improvement that of cotton textiles. Pakistan i present producing about one third of total cloth requirements and the ou will be substantially increased by the end of December 1951. Orders for lakh spindles, costing nearly Rs. 8 cr will shortly be placed on behalf of Government, in addition to an equal number of spindles allotted to private parties. When this present programme of nearly nine lakh spindles is completed the country will have enough capacity to

roduce twelve yards of cloth per capita. Steps for the manufacture of woollen extiles have also made considerable progress and a purchase mission has gone broad to finalise the purchase of machinery and other equipment for two Government mills.

Three jute mills, for which machinery ave been ordered, are under construcon at Narayanganj (East Pakistan). One of them is expected to go into production by the middle of the year, followd by the second mill in 1952 and the hird mill in 1953. Pakistan Government as also agreed to participate in the stablishment of three other jute mills.

Exceedingly good progress has been ade with the paper mill project and it is oped that by the middle of 1952, the ountry will become largely independent f imports of quality paper. Other dustries which have registered appreciable progress include chemicals, soda sh and caustic soda, leather, cement, harmaceuticals and coal-mining. The evelopment of coal mining has resulted the production of coal going up by early 30 per cent. It is further noted at Rs. 82 crores have been earmarked r agriculture in the six year-developent plan. Government is planning to set an Agricultural Development Finance orporation with a capital of Rs. 5 cros, and a bill on the subject will be troduced in the legislature in the rrent session.

The development of commercial nking has made steady progress uring the year and 29 new offices— 7 West Pakistan and 12 in East Pakisn have been opened by scheduled banks. he National Bank of Pakistan has ened 8 new offices bringing the total mber of its offices to 16.

**NEW INDO-EGYPTIAN TRADE PACT**

The Commerce and Industry Ministry lately announced the conclusion of a fresh trade agreement betwen India and Egypt. The agreement takes retrospective effect from March 1, 1951, and is to remain valid upto February 29, 1952. The last agreement between India and Egypt was from July 1949, and it expired in July last. After the expiry of the last agreement, a barter pact was concluded providing for import of rice against jute goods while the renewal of the agreement was under consideration. The new agreement makes no provision for the import of foodgrains from Egypt and export of jute manufactures from India, but it is understood that a separate pact will be concluded later to cover these commodities. In 1948-49 the value of India's imports from Egypt were Rs. 31.89 crores and exports Rs. 7 crores. In 1949-50 imports totalled Rs. 39.4 crores and exports Rs. 7.85 crores while for 1950-51 (upto December 1950) the corresponding figures were Rs. 18.77 crores and exports Rs. 4.02 crores. From Egypt cotton is the principal commodity India imported. Under a clause in the agreement the two countries will accord to each other "the most favoured nation treatment".

Exports from Egypt to India under the new agreement will include raw cotton, cotton yarn, gypsum and flax. Exports from India to Egypt will include tea, unmanufactured tobacco, certain oils and oil seeds, shellac, coffee, cotton piecegoods, manufactures of iron and steel, cutlery, electrical goods and sanitary ware.

**ATOMIC RESEARCH**

That valuable deposits of atomic energy minerals have been discoverd in India is gathered from the reply by Shri Sri Prakasa, Minister for Natural Resources and Scientific Research while

onding Material — The bonding ial used in crucible industry should highly plastic and have good cover-ower, (ii) afford good protection to against oxidation, (iii) capable of ion to graphite grains and ensure iate green strength, (iv) free from itits — particularly grains of low-g fluxes, and (v) have adequate re-riness and dense texture, resistance g action at the temperature at which ucible is applied, and be thermo-: at that temperature. Of these, st condition is important. Graphite les are used for melting metals widely differing melting tempera- Thus, while a crucible for brass ing must have adequate strength and resistance to penetration by slag or metal at temperatures near about 1100°C. the crucibles for cast iron must have the same strength at 1250°C. and that for steel in the range of 1400° to 1600°C. Thus, the importance of a thorough knowledge of refractoriness and other properties of clays at high temperature becomes obvious in crucible manufacture.

## FORMING METHODS

Body Mixer & Mixing Procedure—Much of the information on this subject is a trade secret and is not easily available. Some of the compositions tried on a laboratory scale and found satisfactory are given in Table I.

**Table I.—Crucible Mixture Compositions.**

| Constituents. | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) | (l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| aphite, % ... ... | 40 | 40 | 42 | 43 | 42 | 42 | 40 | 46 | 43 | 49 | 44 | 50 |
| ay, % ... ... | 40 | 37 | 36 | 35 | 34 | 32 | 32 | 32 | 31 | 31 | 30 | 30 |
| licon carbide, % ... | 10 | 13 | 12 | 12 | 14 | 16 | 18 | 12 | 16 | 10 | 16 | 10 |
| og (% of the total body) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 |

r steel-melting crucibles, kaolin, in tures with more plastic bentonite all clays, forms a suitable bonding al. Siliceous clays, Jubbulpore and ra varieties, may prove suitable for on melting crucibles and the same mixed with bentonite or plastic al of lower fusibility may prove e for brass founding crucibles. For and other low temperature melting , the crucibles have to have a bond suits those temperatures. This of crucible industry has not receiv-ch attention in India.

India, the choice of bonding clays ted to a few siliceous fireclays of ra and Jubbulpore and the alumi-clays from Messrs Bird & Com- clay quarries. These clays have y high refractoriness in the range made with these clays have given a tolerably good service in the cast iron foundries. Below this range, they are highly permeable and above this, refractoriness, particularly of Rajhara and Jubbulpore clays, deteriorates rapidly. and their strength is inadequate for steel foundry.

Fireclay Grog—In U.S.A. and other foreign countries only graphite and bond clay go into the crucible mix. Recently, however, carborundum is replacing a part of graphite. The use of silicon carbide is not manufacturtd in this country and is very costly. The fireclay grog used is usually of the same clay as has been used in the bond. Clean graded grog is usually employed.

The use of binders, plasticizers and

literature. **In this country, however, the use of such ingredients, particularly alkalies and alkali silicates, has not found favour.**

The clay in compositions (a) and (b) was a mixture of Jubbulpore fireclay and bentonite in the ratio of 95: 5. Jubbulpore clay was used in others. The following is the grain size of the constituents:

| | Grain size between |
|---|---|
| Graphite | 40 to 100 mesh. |
| Silicon carbide | 50 ,, |
| Clay | 100 ,, |
| Grog | 16 ,, |

The mixing of ingredients by such methods as pugging by feet, in vogue in India, are inefficient and large quantities of air gets entrapped in the wet mix. Also manual methods of mixing need a higher percentage of water than mechanical methods. Both these factors render the resulting body porous. Porosity may be a distinct advantage in a fireclay grog body as it gives certain amount of resistance to thermal shock, but is, to a large extent, unnecessary in a graphite clay body, as it increases the vulnerability of the crucible wall to metal and slag penetration. It is, therefore, considered better to mix the constituents dry in a suitable mixer, and knead the mix with minimum quantity of water in a Werner Pfleiderer type of kneading mill or pass it through a de-airing pug mill. This may give a workable mix with enough green strength to stand forming and finishing.

Crucible-making—The usual methods employed in making crucibles are (i) jiggering in plaster moulds, and (ii) pressing in steel dies in hydraulic or mechanical presses. The Indian manufacturers, however, have adopted a different method. **A wooden or machined cast iron mould and a plunger of similar material are usually employed. The manual operations involved in the process increases the cost of manufacture and uniformity of products is not obtained.**

Graphite crucibles depend for their mechanical strength and conductivity on the orientation of the graphite particles in the body. Thus (i) the flakes should be parallel to each other and parallel to the outer surface of the crucible wall, and (ii) must be as closely packed together as possible. In the forming process, therefore, the pressure applied must be so directed as to achieve the above orientation and the pressures used in the various stages of forming must, as far as possible, be similar to each other in direction.

The authors are not aware of any slip-casting work done in graphite crucible manufacture. The slip-casting method, however, has its advantages for the production of crucibles in the small size range (gold and silversmiths crucibles) and may be worth investigating, particularly as it is easy to get dense, thin-walled ware by this method. Similarly, dust-pressing and hot-pressing methods have certain advantages. One advantage is that items like ladle plugs, stoppers and lids can be mass produced. These are promising lines for investigation.

For satisfactory drying of green crucibles, it is necessary to have a good control over humidity, temperature and speed of the draught of air employed for drying. In the absence of proper control, internal weaknesses develop in the crucible walls and there will be a lack of uniformity from one batch of crucibles produced to another. Thus, standardization of drying methods, design and application of suitable driers are of great importance in this industry.

Glazing—Glazing of graphite crucibles is necessary as, in the initial stages of

service, the finished, unglazed crucible absorbs moisture from the atmosphere, which is harmful. Besides, the graphite particles may get oxidized. The glaze is usually a felspathic glass high in manganese dioxide. It is fritted, quenched and slip ground to the required fineness. This slip is applied by brush on to the dry green crucible before further drying.

The composition and mode of application of the glaze has not been fully examined by Indian manufacturers. High manganese dioxide glazes are difficult to melt because they need comparatively high temperatures and longer founding time. As they are usually deep violet in colour, it is not easy to determine whether all the batch ingredients have melted. In many instances manganese dioxide continues to remain in a state of suspension. This fact has been overlooked by the Indian manufaturers, who have been applying an unfritted mixture of manganese dioxide and other glass batch ingredients. Secondly, no attempt has been made to fit the glaze to the body. There is no universal glaze which can fit all types of bodies and each individual body needs a suitable composition.

Firing—The Indian manufacturers employ ordinary coal-fired, down-draft kilns for the purpose. The crucibles are set in saggers, the smaller sizes being nested in larger sizes. The saggers are filled tight with coke dust. Each sagger has its own lid luted on with a fireclay-grog paste and the individual sagger bungs are further luted with the same paste as a precaution against leakage of furnace gases into the saggers and burning away of coke. The arrangement has worked out very satisfactorily.

The firing schedule consists of a preliminary drying period in which the kiln is raised to about 100° to 12· C. an there until all the moisture has bee moved. Then the fires are built on the temperature is raised to 500 C about 3 to 4 hr. Between 500° to 650 a soaking (for the combined moisture clay to go out) is given. Temperature next raised to 1000°C., another soak given at this temperature for not le than 8 to 10 hr. (to equalize the tempera ture all over) and then the kiln ... off. The whole firing schedule ta... to 30 hr. Strict precautions are tak... prevent ingress of air into the kiln ... cooling.

When the furnace has cooled ... crucibles are taken out and given ... of varnish and stored in waterproof ... before despatch.

## SERVICEABILITY

For satisfactory service a cru... must have (i) an adequate refracto... under load, (i) a high thermal ... resistance, (iii) thermoplasticity, ... resistance to mechanical abrasion, and ... resistance to slag and metal attack.

The Indian graphite crucibles ... given reasonably good service in the iron foundry field. Up to size 60, ... crucibles have given a good perform... Sizes beyond number 80 have given ... performances. Salamander crucibles ... on an average 30 heats in a pit furn... The Indian crucibles have somet... given 26 heats, but in general are ... satisfactory. An important propert... the Salamander crucibles that the In... crucibles do not have is that the fo... are serviceable even when they h... worn out very thin. This indicates a ... markable uniformity of texture of th... Salamander crucibles.

## CONCLUSION

It will be apparent from the forego... that the Indian crucible industry suf...

ree major technological draw- namely (i) selection of bonding ial leaves much to desire inasmuch e crucibles are unsuitable for applica- in non-ferrous and steel foundries. etailed study will have to be made of clays available for the purpose in lia and suitable blends will have to be veloped, (ii) manufacturing methods need mechanization and standardization, (iii) the protective coats for the crucibles should be studied, and (iv) processing of the body constituents and forming ware are problems that require investigation. The future success of the Indian crucible industry depends to a great extent in finding satisfactory solutions for these problems.

# —MANUFACTURE OF BELTING LEATH

LEATHER belting is an important article in engineering workshops. Without this the efficiency of the work is much hampered. This belting leather is made from strong buffalo and ox hides.

Leather belts must be tough, flexible, fairly resisting to heat and not too greasy. Formerly vegetable tanned leather suitably carried was used for the belts. But now-a-days chrome tanned belts are preferred, as they are very tough, flexible and stand heat much better than the vegetable tanned variety.

### RAW MATERIALS

Either thick, ox or buffalo hides are used for making leather for belts. Ox hides being of a close texture produce a better and more durable leather than buffalo hides, the texture of which is comparatively loose. But as ox hides of an adequate thickness are not available in this country buffalo hides are the chief raw material for making belts leather.

Spready and thick buffalo hides, the major portion of which may yield leather of about ¼ inch thickness should be selected. The hides of female buffaloes are preferable to those of male animals, as the former are closer in texture and tougher in substance than the latter. Male buffalo hides produce a thick spongy leather which is decidedly inferior to the leather obtained from she-buffalo hides.

Whenever possible the hides should be brought from sources of collection in the wet-salted condition. In winter months there is little risk of putrefaction if the hides are well salted. But in summer putrefaction may set in during transit, specially in railway wagons which get very hot in the strong summer sun. Application of one or two coats of a 5 per cent solution of zinc chloride before ... will immensely improve the preserv... the hides.

Dry and dry salted buffalo hide... contain in the pack damaged hides... putrefy either entirely or in places... soak or lime liquor. Hence there is ... some uncertainty as to results, wh... stocks are handled. In India, the d... dry-salted goods cannot, howev... altogether avoided as bulk of the ... hides are preserved by dry or d... curing.

### SOAKING

Green hides are washed in ... changes of water to cleanse while dr... dry-salted hides are soaked until th... sufficiently soft. Either caustic so... sodium sulphide is used in the prop... of 1 part of the former or 2 parts ... latter for 1000 parts of the soak ... The operation of soaking should be ... in pits and in drums, which will mak... hides rather too soft.

### ROUNDING

Only the butt portion of hides ... yield beltings of the required thicknes... strength. Hence soaked hides are rou... into butt, bellies and shoulder. In ro... ing care should be taken to cut out ... butt in such a way that there may no... much wastage of leather in cutting st... for belts, while bellies and shoulde... (offal) are treated for vegetable tann... for making insole leather.

### UNHAIRING AND LIMING

A sodium sulphide and lime paste made from 1 part sodium sulphide, ... parts lime and sufficient water to ma... the mixture of a soupy consistency. T... paste is applied on the flesh side of bu...

ich are then folded down the ridge and n again at the middle so as to make a it bundle. The pasted and folded butts kept overnight, and the following rning they are laid flat in a pit contain- freshly made lime liquor. The butts handled once or twice in this lime ing the day. They are taken out, un- red, washed and fleshed. The fleshed ts are then weighed. After weighing y are washed in pit at first in 2 or 3 nges of water and subsequently in a ix solution for an hour using 1½ per t borax on the pelt weight in a sufficient t of water.

**DELIMING**

The well washed butts are now delim- Formerly deliming was done by bating 1 hen or pigeon dung in a pit or paddle now-a-days weak acids and synthetic ng materials are employed. According me method the butts are first bated by bling in the drum for about 2 hours in olution of synthetic bate peroly, panc- or oropon. One pound of the bate per pounds of pelt may be used. When have been delimed to the nt of one-third of their thickness on grain and flesh sides, the butts are n out and scudded. They are next ted with a solution of boric acid of h 2 per cent on the pelt weight should sed and the drumming continued until deliming takes place which should be rtained by the phenolphthalin tube. boric acid should be added in two lments.

According to another method the butts irst treated with 1 per cent acetic acid in hour, then they are bated with 1 cent pancreol, peroly, oropon or any synthetic enzyone bate for an hour, scudded. All the materials are oned on the pelt weight.

After full deliming the butts are ed.

**PICKLING**

The pickling is done in 1½ per cent Sulphuric Acid (sp. gr. 1.74) and 15 per cent salt on pelt weight. The butts are run in the pickle for about 3 hours. Then they are tanned.

Instead of acid and salt, pickling may be done with alum and salt using 6 per cent of each on the pelt weight and keeping them in pits overnight in the bath.

**TANNING**

Tanning may be done by either the double or single bath chrome process. The double bath process causes deposition of sulphur on the fibres, which is supposed to render the leather capable of withstanding the somewhat high temperature to which belts are raised, due to the mechanical action to which they are subjected. It is better than the leather tanned by the single bath method.

**DOUBLE BATH PROCESS**

In the Handbook of Tanning by Mr. B. M. Das the following process has been dealt with. Here the pickled goods are entered into the first or the chroming bath which may be prepared as under:—

Take on the pelt weight:—

| | | |
|---|---|---|
| Bichromate of soda | 8 | per cent. |
| Sulphuric acid (sp. gr. 1.74) | 3½ | ,, ,, |
| Common salt | 8 | ,, ,, |

Dissolve these ingredients and prepare the bath with sufficient water to give the goods an ample float. Put the goods in this liquid for about 6 hours at the end of which cut a portion of a hide from its thickest part and see if the yellow colour of the chromic acid has penetrated completely into the hide. If it is yellow throughout the thickness of the hide, the chroming is over. If there be a white streak at the centre, the penetration of the chromic acid is still incomplete and the

**period of coaking may be continued. The fully chromed butts are taken out of the pit and horsed up covering the pile with canvas or tarpaulin to protect them from the action of light which is injurious at this stage.**

Next morning the reduction or the hypo bath is prepared in the following manner:—Dissolve in a tub 20 per cent hypo on the pelt weight and add the solution with sufficient water. Put in 8 per cent of salt on the pelt weight and stir well so as to dissolve the salt in the liquor.

In another tub dilute 5 per cent Sulphuric acid (sp. gr. 1.47) on the pelt weight with sufficient water.

Add one-third of the dilute acid to the hypo liquor in the drum, stir up well and enter the goods. Close the mouth and run it half an hour, then add another one-third of the acid to the drum through the hollow axle while the drum is still rotating. After further one hour the last portion of the acid is put in and the drumming continued until the reduction is complete. This is ascertained by cutting a piece from the thickest portion of a butt. If the colour is blue throughout its entire thickness, all the chromic acid has been reduced to the basic chromic salt and the reduction is complete. If the cut shows a yellow streak, the process of drumming in hypo-solution should be prolonged with further addition of hyposalt and acid if required, adding them in the proportion of 4 to 1.

After complete reduction has been effected a piece should be cut out from a butt and boiled for 5 minutes. If it does not shrink, tannage is thorough. If there be shrinkage, tanning is still deficient. Leather tanned by the double bath process does not always stand the boiling test, but it does not matter as very nice strong and durable belts are obtained from leather which does not satisfy the boiling test. If it is desired that the leather should stand the boiling test, the pelt should be give further treatment with a quantity of single bath basic chrome liquor. Th be added to the reduction bath w taking the butts out of the drum, ar addition of the single bath liquo drumming should be continued unt boiling test is satisfied.

The butts are then taken ou horsed up.

Another typical recipe follows:—

| | | |
|---|---|---|
| Bichromate of potash | 2 | per |
| Hydrochloric acid | ½ | „ |
| Common salt | 5 | „ |
| Reducing bath | | |
| upto 30 per cent | | Hyposulphite soda |
| 3 „ „ | | Hydrochloric |

Percentages are reckoned on weight of the delimed pelt.

#### TANNING BY SINGLE BATH PROCESS

This may be carried out in the manner. A very convenient plan is to the single bath chrome liquor to the p bath through the hollow axle and comp the tannage in this bath by adding whole quantity of the liquor in sev instalments as the tannage proce Towards the end of the process abo to ½ per cent soda ash on the pelt we should be dissolved and added to the d to increase the basicity of the liquor w a view to make the tannage thorough. T chrome liquor should be of basicity about 52:100 to start off with and incre ed to above 52:80 by adding soda a The proper quantity of soda ash to added would depend upon the acid pres in the pickle bath and the basicity of th stock chrome liquor and can only be form ed out by experience. The soda should b added in 2 or 3 portions either mixing wit the last few instalments of the chrom liquor or after all the liquor has been pu in.

**SAMMING AND SHAVING**

The butts are then taken out and sed upto drain. They are sammed by ting through the samming machine or hanging up in the air. They are now it and shaved to make the thickness en throughout. The shaved butts are ighed.

**NEUTRALIZING**

Neutralization follows shaving. The t material to use for it is borax of which per cent on the shaved weight is ployed. About 1 per cent soda ash may o be used instead of borax. Soda ash utralizes more rapidly, but its action is re drastic than that of borax. Conerable economy may be effected with- deteriorating the quality by neutralizg the surface first with about ½ per cent la ash and completing the neutralizan with 1 per cent borax. The butts ould be run in borax or soda until a rtion cut from a thick place of the ther shows on testing with blue litmus per that it is properly neutralized. ter adequate neutralization the goods washed in 3 changes of water at about C. The last wash water is run off and butts are subiected to other atment specially for belts.

Belting leather need not be so pliable that for picking hand and must be abutely stretchless. On account of this limited amount of grease is incorated into it, as grease makes the ther both pliable and stretchy. Some ners omit the fat. liquoring operation gether. They stretch out the neutrad and sammed butts on stretching mes and coat the grain with a fairly k mineral oil. A thick lubricating oil y be used for the purpose. The flesh e is lightly coated either with dubbing de from tallow and fish oil or with a xture of degras and vaseline. The ing is effectd slowly.

Others fat-liquor lightly. A fatliquor made with 2 per cent. hard soap and 1 per cent. castor oil on the shaved weight of the leather may be used. After drumming slowly for tbout an hour in the fat-liquor the butts are taken out and horsed up overnight. Next day they are slicked and nailed out on frames straining to the utmost extent to take as much of the stretch out of the leather as possible. The butts are dried out completely. They are then off the frames and put in damp sawdust overnight. They are then stacked and nailed out again on frames and dried out completely.

The butts are fluffed on the flesh side, rolled heavily, and french chalked on both grain and flesh.

Chrome belting leather is also sometimes stuffed with grease. The composition of grease determines the character of the leather as regards either firmness or pliability. A typical stuffing mixture is given by H. G. Crockete in his book "Practical Leather Manufacture," on page 131:—

| | | |
|---|---|---|
| Paraffin wax | 40 | parts. |
| Tallow or stearine | 30 | ,, |
| Degras | 30 | ,, |

The leather after adequate samming preferably by a samming machine is stuffed in the hot air stuffing tumbler at a temperature of 50° to 60°C. The amount of the stuffing mixture used depends upon the pliability desired in the leather, 10 to 30 per cent in the weight of sammed leather may be employed.

After stuffing the butts are set out and hung up to dry partially. They are set out again tacked on boards and dried out completely. The butts are trimmed, rolled and brushed by machine. To remove stretch they are stretched out on stretching machines.

The leather is now ready for cutting into straps for machine belts.

## —Construction of Fluorescent Lamp

FLUORESCENT lighting began with the discovery of the fluorescent powders giving white or nearly white light. Before the II World War, high voltage tubes were in use and experimental lamps working at mains voltage had been made. The war prevented the commercial development of these low-voltage lamps. Since then rapid progress has been made.

The high efficiency of the lamps has been further increased, different colours introduced, a variety of sizes made, and large scale production set going.

Using far more materials than ordinary lamps, and calling for more elaborate processes, the lamps are nevertheless being made at the rate of thousands a day in a typical large factory.

Main components are the glass tube, the "seals" carrying the electrodes the fluorescent powder with which the inside of the tube is coated, and the gas filling. The glass tubes are made by automatic machinery and are delivered, cut to length, the tubes being dry cleaned internally before use in the factory. The various types of fluorescent powder are ground under carefully controlled conditions to obtain the desired particle sizes and mixed in a thin cream in nitro-cellulose, which serves as a binding medium. The quantities of powder and binder must be correct within narrow limits to ensure uniformity of coating thickness.

The glass tubes are held vertically over tanks holding the suspension, which is then forced up inside the tubes to the required level by means of compressed air, and in draining back leaves a film of powder and binder adhering to the glass. After a short draining period the tubes are placed in a drying tower where they remain for some 30 minutes by which the fluorescent coating is adhering enough to the glass to prevent d... ment by further handling.

Frequent tests are made on the ... cosity of the fluorescent mixture. Th... important as any variation may affe... adhesion of the powder to the tub... the efficiency at which the lamp ... operate.

After the application of the co... the tubes are stamped with the trade ... and other relevant details and p... through a gas furnace in which ... are heated to a temperature which de... composes and evaporates the bi... leaving a thin dry coating of po... adhering to the glass tube. As they emerge the quality of coating is checked. Simultaneously with this check of the coating, the powder is buffed off the ends of the tubes to have them with ... exact length of coating required for sub-sequent operations.

At each end of the fluorescent la... there is a cathode, consisting of a tu... sten coiled—coil filament, and an an... which, according to lamp rating, eit... takes the form of a pair of metal pla... attached to the leading in wires, or is ... integral part of these wires.

The assemblies upon which the electrodes are mounted follow the sa... general design as the airtight "pinch... which is so familiar a part of an ordina... electric lamp. Current is carried to an... from the electrodes by leading in wires made in three parts—copper for the external contact to the cap, copper plated nickel iron for the airtight joint, nickel inside the lamp. Flanged glass tubing provides a means for sealing this assembly to the bulb, and a smaller glass

be allows the lamp to be exhausted and is filled at a later stage.

After these components of the "pinch" ave been welded together on automatic achinery, the nickel lead wires are bent a jig to the required shapes and the thodes clamped into position, anode ites where required being spot-welded extensions of the leads. The cathodes e then coated with electron emitting aterials, consisting of a mixture of rium and strontium carbonates in nitrocellulose "binder," the latter ing decomposed subsequently by passing a small current through the electrodes.

The completed assemblies are then iced in the heads of a rotary machine coated glass tube is placed over each. means of gas jets the ends of each be are in turn joined to the flange of assembly and the surplus glass of the be falls away. The lamps are now exusted, "closed" with pure mercury and ed with argon, this being carried out on ilti-head automatic machines. The air removed in successive stages by an borate mercury vapour pump system ich produces an extremely high degree vacuum. During the exhausting process, the lamps are subjected to a temperature of 480°C., this having the effect of driving from the glass any occluded gases, which are then removed by the pump. The coated cathodes are heated by the passing of a progressively increasing current and the gas so freed is likewise removed by the pumps, the flow of heat from the cathode will serve to activate the emissive coating.

The exhaust machine cycle concludes with introduction of a small quantity of argon and the sealing of the exhaust stem. The caps, which have previously been filled with cement, are placed in position and are firmly fixed by baking in the capping machine, the lead-in wires being subsequently soldered to the cap terminals.

The lamps, now complete, proceed to the ageing rack where current is applied for about 30 minutes to stabilise the ready for use. They are then subjected to a thorough test for general overall efficiency before being packed and put into stock ready for transport.

The table giving below types which have been standardised by several leading manufacturers:—

FLOURESCENT LAMP DATA

| Lamp Rating (Watts) | Lamp Running Current (Amps.) | Choke Loss (Watts) | Nominal overall Length (Ins.) | Bulb Diameter (Ins.) | Average Life (Hours) | Average Light output Daylight and Warm White | Lamp Cap | Natural |
|---|---|---|---|---|---|---|---|---|
| 80 | 0.85 | 20 | 60 | 1½ | 3,000 | 3,040 | B.C. | 2710 |
| 40 | 0.41 | 12 | 48 | 1½ | 2,500 | 1,720 | Bi-pin | 1520 |
| 30 | 0.34 | 10 | 36 | 1 | 2,500 | 1,200 | Bi-pin | 1080 |
| 40 | 0.85 | 20 | 24 | 1½ | 2,500 | 1,160 | Bi-pin | 1040 |
| 20 | 0.35 | 12 | 24 | 1½ | 2,500 | 620 | Bi-pin | 560 |
| 15 | 0.30 | 10 | 18 | 1 | 2,500 | 420 | Bi-pin | 375 |

**LAMPS FOR A LIVING ROOM**

***(175—200 sq. ft.)***

| *Type of Lighting Fitting.* | *Number and size of Fluorescent Lamps.* |
|---|---|
| *General Diffusing* | *2-30 Watt ( 3-ft.) or* |
| | *2-40 Watt ( 2-ft.) or* |
| | *4-20 Watt ( 2-ft.)* |
| | *6-15 Watt (18-in.) or* |
| *Mainly Indirect* | *3-30 Watt ( 3-ft.) or* |
| | *Combination of* |
| | *2-40 Watt ( 2-ft.) and* |
| | *2-20 Watt ( 2-ft.)* |

A possible cause of complaint among users is that of choke harm. Even with good quality components there is sometimes a disturbance which can be detected by those possessing good hearing. One cure is to locate the choke in a remote position and a further precaution is to arrange for insulated mounting.

Sometimes there is dissatisfaction due to flicker from the ends of the fluorescent lamp becoming noticeable in the "corner of the eye," producing visual disturbance when one is not looking directly at the lamps. The solution is to see that fittings are designed to shield the ends of the lamps.

The general tendency is to design fluorescent lighting fittings so as to accomodate the choke and condenser, provision being made for adequate ventilation and protection against mechanical damage. If there are instances where this is not done, the auxiliary gear, if located within 12 ins. vertically and 6 ins. in any other diretion of soft good or other combustible material, should be enclosed in a fireproof housing.

With regard to power factor, it is sometimes found more economical in large installations, to arrange for multiple correction of a bank of fluorescent lamps rather than correct each individual lamp. If the former method is adopted the installation must be such that a power-factor condenser of suitable capacity is inserted across the mains in each portion of the sub-circuit controlled by a separ[ate] switch.

On the subject of switching, [the] fact that some types of switches [are not] specifically designed to break in[ductive] load at full rating. If used to [control] fluorescent lamps these types must [have a] current rating of at least twice the [value] of the steady current they normally [carry].

Similarly circuit wiring should not [be] rated to carry merely the nominal ste[ady] current. The known or measured curr[ent] should be multiplied by the factor 1[.]. If the current cannot easily be measure[d] and providing the power factor is correc[t]ed to 0.85 or better, it is permissibl[e to] calculate the circuit rating by multiply[ing] lamp wattage by two and dividing [by] mains voltage. Where the circuit inclu[des] tungsten lamps, the extra current [for] these is obtained simply by dividing [the] watts by main voltage.

A most important precaution, [often] often overlooked, is to ensure that [all] exposed metalwork shall be earthed [and] fittings should be provided with earth[]ing terminals accordingly. Altho[ugh] fluorescent lamps may be operated on [DC] mains, this involves certain complicat[ions] in wiring and switching and in any [case] performance is not upto the standard [of] that on AC. If, however, the circumst[an]ces are such that motor generators [or] convertors are employed for the provis[ion] of the requisite AC. the circuit should [be] earthed to one terminal of the genera[tor] or convertor.

## —TASAR SILK.

By Benode Behari Thakur.

[T]ASAR (Kosa or Koushik Bastra) is [i]ndigenously known throughout the [cou]ntry and was perhaps one of the oldest [r]ural gift of occupations to a number [of] people. Besides the luxury value at[tac]hed to silk, a symbolic and sacred im[po]rtance is attached to it by the Hindus, [an]d it is that refers to the *Kshoumabastra* [in] Manusamhita and Rigveda. To many [pe]ople as yet, in the country side in the [e]art of India, the use of silkcloth as [P]attabastras is as yet served by Kosa [cl]oth and they know very little of the [su]perior silk of mulberry variety. Tasar [is] grown by a kind of silkworms (Anthe[re]a Myllitta) more prone to natural condi[ti]ons, on different kinds of trees in the [o]pen generally in the forests. They [g]row in the wild and semidomesticated [st]ate, commonly on Asan, Saj, Yen (Terminalia Tomentosa) Sal (Shorea [R]obusta) and also sometimes on Termi[n]alia arjuna, Zizyphus Jujubaer (Kul or [B]aer) trees. The forest area of Central [P]rovinces and Berar, Behar and Orissa [a]nd Hyderabad (Deccan) and as Bengal [w]hich once included the districts of [S]hinghbhum, Manbhum, and Santhal Par[g]anas, Ranchi, Hazaribagh and Moyur[b]hanj State produced ample quantities of [T]asar, so much so that after a major por[t]ion of half of the annual production of [T]asar silk, were used by the weavers of [B]ankura, Birbhum, Burdwan, Hooghly [a]nd Midnapore, quite a good quantity of [s]ay 2,25,000 lbs. of Tasar reled in the [f]actories of M/s. Louis Payen & Co., at [t]heir Murshidabad Factories, used to be [e]xported to France annually. About [5].000 families of weavers consisting of [a]bout 20,000 people of the districts now [i]n West Bengal, depended on Tasar spinning and weaving. Bengal Tasar as such had a good name, in the foreign market.

Even today, India, exported mostly through the Calcutta Port, the following quantities of Tasar waste to abroad at rates very liberal.

| Year. | | lbs. | Approximate Value Rs. |
|---|---|---|---|
| 1942-43 | ...... | 3,40,000 | 6,50,000 |
| 1943-44 | ..... | 89,000 | 1,00,000 |
| 1944-45 | .. .. | 40,000 | 1,70,000 |
| 1945-46 | ... | 1,15,000 | 1,50,000 |

*The figures are exclusive of exports of mulberry-silk-waste.

Though at present, the production of Tasar cocoons within the areas of West Bengal might be negligible, a fair quantity of Tasar would be in demand by the weavers of the districts mentioned above. They could get their Tasar yarn or cocoons from the neighbouring districts of Behar mostly and portions from Orissa and Central Provinces. This demonstrates that though the area of production of Tasar in Bengal might be negligible, production of Tasar yarn within the areas of West Bengal, and exports of Tasar wastes through Bengal, still take a prominent part.

#### PRODUCTION OF TASAR COCOONS

Production of Tasar cocoons no doubt provides a good subsidiary occupation with less or no cost, but the nature of privations, the rearers have to undergo, as dictated by nature, customs and religion, coupled with the difficulties on restrictions in using forest areas and forest plants and also degeneracy of worms; have made the industry reduced. And the rearers are now more inclined to raise

only the yielding crops in Autumn, the seed crops and other catch crops being ignored, by the general rearers. The successful seed crop growers make no doubt a good profit by selling seed cocoons at 10 to 15 cocoons per rupee and sometimes at more costs.

#### REELING OR SPINNING

The quality and size of different varieties of cocoons as grown in different localities, and conditions, on different varieties of trees, vary. Such cocoons are sold on different trade and local names, such as Naryah, Mudhya, Dabha, Jadui, Bugul etc. The quality, lustre and other physical properties with regard to strength, elongaion etc. also vary.

The cocoons are softened by a crude method with country ingredients, and are reeled in 3 or 4 filaments drawn together from 3 or 4 cocoons on to a simple Natwa worked by right hand, while the individual threads are given a physical twist to make them adhere together, on the left thigh of the reeler with left hand. The rendita of Tasar cocoons according to the quality and size of the cocoons vary from 50 to 120 Tolas per 100. Equal quantity of waste, besides the peduncles or stems of the cocoons which also contains silk content in stiff condition, is obtained. The waste of Tasar is disposed off at a very cheap cost of say -/2/- to -/4/- per lb. The peduncles are thrown away.

#### QUALITY

Unlike Mulberry cocoons, the Tasar cocoons possess a peduncle at the head to the mouth of the cocoons which support on the twigs of the trees. After the cocoons are softened, this gets loose and render unsuitable to reel in one continuous filament on sinking method in a Reeling pan. Attempts were however made sometimes to overcome this but no successful effort of economic importa[illegible] is on records. Tasar fibre are striated [illegible] do not adhere together stickily. [illegible] quality and other properties are no[illegible] very satisfactory, and it is that the [illegible] are made good use of by f[illegible] machinery is spinning into suitable[illegible] The one single filament gives a re[illegible] length of about 1500 ft. and is so [illegible] that the titre of the filament is me[illegible] at 10 to 15 deniers and gives a str[illegible] of minimum 1.6 to 2.5 gramme [illegible] denier and an Elongation of about 22 [illegible] per cent. Some authorities, recorded in past for some quality of the cocoons [illegible] give an Elongation of as much as [illegible] 30 per cent. which is of course a matter [illegible] observation with precision for avail[illegible] cocoons of different qualities. The spe[illegible]fic gravity of Tasar yarn is 1.250 w[illegible] the mulberry gives 1.329. Better reel[illegible] process or methods to obtain unif[illegible] quality of silk, if possibly explored, w[illegible] have therefore given one of the best [illegible]petus to the Tasar production to a st[illegible] of whatever condition it still exists. [illegible] the past, attempts, no improveme[illegible] reeling was called for and the sys[illegible] prevalent in the Sambalpur districts [illegible] in Orissa, seemed to serve the purp[illegible] very well for that time. Improvement [illegible] seeds, checking the degeneracy of wor[illegible] exchange of seeds and possible assist[illegible] to the Tasar growers by alloting suit[illegible] forests; were taken to be the [illegible] criterion. This project with ends in v[illegible] as may be working in some of the T[illegible] growing province in Chaibassa in B[illegible] and one at Armori in C. P., might [illegible] doubt help in surviving of the producti[illegible] of Tasar cocoons. But when the yield [illegible] or economic production of anything ul[illegible]mately interlaces with the remuneratio[illegible] the better quality of the material or st[illegible] would no doubt render its good share [illegible] yield. Having fair degree of composit[illegible]

e qualities and physical properties of Tasar if economically used for such r better utility purposes, may have ed a better intrinsic value. Silk is d in various purpose other than utility in clothing as luxury goods. physical properties and chemical position of silkmulberry silk are as h that renders their use in manufacture various articles of men's needs. Silk silk components play an important e in the sinews of war for use in Parachutes, Cartridge bags, Indulators, rgical articles, Ligature from guts, etc. k and the body fluid of the worms are y rich in Carbon content. In Japan, ive Carbon are produced from the stes of Silkworms. Fine pupae oil is duced from the pupae inside the cons. The oil further refined by ben- process is used as sauce and for nufacture of soaps. Aminoglyceric l is produced from sericine or gum tent. Owing to the inherent common culties, it may of course go difficult to lore possible and easy ways of utility erve immediate economic gain similary Tasar or on wild worms before it passes ough experimental or rather Labora- stages. Owing to variations in the ibution of micellaes in the structure he Tasar filaments, it has been observ- that suitable ligature nuts can not be ined from the silk glands of the Tasar ms. Similarly corresponding defects rent may discourage for use in other ches also. But the purpose of ider utility in improving the quality of ar yarn and manufacture of spunsilk Tasar waste in the country, may no ot be visualised to be an effective at- ot after they are perused with care. ol-like fibres can be dermed by treat- t with detergents made from sul- ated higher alchols and a further ment in aqueous Potassium Bi-chromate and Aluminium chloride with a subsequent immersion in a solution of cow-hair, pig-bristles or feathers in hot strong alkali.

**ATTEMPTS MADE AND POSSIBLE EFFECTS**

Tastes and fashion have by now changed from lustre to quality. Fabrics from twisted tasar yarn still finds a good favour among the consumers. A rational attempt in mechanical shaping and spinning processes may however be helpful. The writer had the opportunity to come across a few samples of Tasar spun silk turned out in the Mysore Spun Silk Mills Ltd., from the wastes of Bilashpur district in C. P. Quality of the yarns seemed to be promising. If the wastes of Tasar which contain good amount of silk content be utilised on economic units, the considerable quantities of exportable Tasar wastes, which as illustrated in above (compiled from the D. G. C. I. S. Statistical Abstracts) accrues very little and nominal costs would no doubt yield a good return to the industry and implement the intrinsic side of the industry.

Evidently the relative yield thus casts valuable bearing on the employment of the rearers in raising of their crops, irrespective of the natural conditions and quality of the cocoons produced in each season, which may vary in number and in weight, in relation of 128 (Bara-muga) to 600 (inferior) cocoonshells in a pound. Average quantity of Dabha variety of Behar weighs 250 to 300 shells in a pound. Naturally amount of waste in relation to labour which is more high in case of reeling or spinning from smaller cocoons, is also more. The utility in weaving and the economic production of yarn from the Tasar cocoons should, therefore, on the other hand, attach a great importance for successful efforts.

**SOME ANALOGY WITH THE SILKWORMS OR MULBERRY VARIETY**

On an analogy with the silkworms of mulberry variety, the programmes suggested by Mr. N. G. Mukherjea, the then Assistant Director of Agriculture, during the year 1905, given in the following were worked in the past. This proved to be a failure, except to render an encouragement to the local rearers in continuing their work.

PROGRAMME:—(a) Establishment of Tasar rearing Nurseries, where rational methods of propagation of trees and reeling be taught and where ample quantities of bonafide wild and semi-domesticated seedcocoons will be distributed.

(b) The propagation of Asan or saj trees.

(c) Reservation of forest trees.

(d) Exchange of seeds.

As stated above, the Tasar stations working in Behar and in C.P., with the present sub-vention, though on the lines of the past attempts with experiences thereof, may successfully render some help to the industry. But attempts of utilising Tasar for better purposes or for better qualities, may further benefit the manufacturing interests, i.e. Tasar spinner and weavers concerned. This will exten its return to the interests even in the non existents with relatively a better yield an outlay. Utilization of Tasar in spinnin mills in India also will directly help running of economic units of Spun Sil Mills.

**ACKNOWLEDGMENTS**

I am thankful to Mr. B. B. Roy Officer-in-Charge (now Superintendent Bengal Silk Conditioning house for hi encouragement in testing certain proper ties of Tasar and to Dr. Paranjpe, well known Physician and Surgeon of Maha Nagpur for his courteous undertaking o preparation of ligature guts and experi ments for their surgical use, when I wa working in the Central Provinces. A Direct-twist process on Tasar has furthe been tried in the Bengal Silk Condition ing House, which seemed to fairly rende a Laboratory success to the effort. Con tinuance of such efforts on tangible limit and a co-ordination with research at th Centre, might be of good value for thi ignored industry and to those-alread working on the liberal lines in th industry.

## —The Cashew Nut: Its Utilisatio

IN most parts of the tropics the cashew is esteemed as a dessert nut and in recent years it has become much better known in the European countries and U.S.A. This nut is indigenous in Brazil, but is now widely distributed and naturalised throughout the warmer parts of the globe. In the coastal areas of South-West India the tree is planted by the Portuguese in the 16th century from where the commercial supplies of the nut are mainly derived at the present time.

The tree yielding the cashew nut may reach a height of 40 feet, but is often considerably smaller, especially when exposed to strong winds, as is the case near the sea, when not infrequently it adopts a low-spreading habit with a gnarled or twisted trunk. It will grow under a wide range of climatic and soil conditions, often succeeding where few other trees or crops will grow, for instance in poor sandy soil or where rainfall is meagre. However, it is at a low elevations in the tropics, not far distant from the sea, where it thrives best and gives the greatest yield of nuts. On account of its ability to grow under adverse conditions it has been used in planting up waste areas and for checking erosion.

In planting cashew trees it is usual to sow the seeds *in situ* at distances of 30 to 40 feet apart. Germination takes place in 8 to 10 days and under favourable conditions growth is rapid, young trees sometimes flowering after 18 months. Young trees may first be raised in nurseries, but they do not always transplant easily owing to the presence of a long tap-root. However, this method is to be preferred when the cotyledons or succulent primary leaves of the seedlings are liable to be eaten in the field by rats or even small herd-boys.

Usually 5 to 6 years elapse bef economic returns can be expected. A f average yearly yield of nuts from a mat tree is reckoned to be about 20 poun approximately 30 per cent of which wo be kernels, although well-grown vigor trees may yield 100 pounds or more. N ripen two months from flowering and usually left to fall from the trees bef being gathered. Although a tree m flower freely, profuse shedding of flowers may take place and only a f nuts mature. This is often the case cloudy weather, although it is believ it may be a vertical characteristic to so extent.

The cashew tree is evergreen w rather tough leathery leaves, and flow borne in clusters at the end of branches. These develop into handso gaily-coloured fruits consisting of a pe shaped, swollen basal portion (or pedicl which is succulent and juicy and bri yellow or orange in colour. It is edi and commonly known as the "cash apple", owing perhaps to its superfic resemblance to a somewhat overripe ap Attached to the end of the "apple" is cashew nut itself; olive in colour and sembling a large kidney bean. In centre of it is the kernel.

The shell of the nut is not und hard or woody, but contains an ac juice that acts as a powerful vesicant a burns the skin in much the same way strong carbolic acid. To the unw attempting to bite open the nut with teeth severe blistering of the lip is lik result. The irritant oil or juice may expelled by heat by hand without risk severe injury. Roasting also improves flavour of the kernel and for these reas

the nuts are always roasted before the kernels are extracted.

Various methods of roasting the nuts are employed in different countries. Whichever method is used great care has to be exercised to prevent over-roasting which results in a charred or discoloured, inferior kernel. One method is to place the nuts in hot sand. A common method practised by peasants in India is to place the nuts, about 6 pounds at a time, in a pan over a fire for a few minutes, stirring all the time to prevent charring. After roasting the nuts are sprinkled with wood ashes so that the pungent oil adhering to them does not harm the hands when they are cracked. Sometimes open earthenware pots are used, perforated to allow the shell oil to escape. In the factories that have been established in India, large-scale methods of roasting have been adopted. This is done by feeding the nuts into perforated rotary drums which are inclined over fires fuelled with the cashew shells. When the nuts come out at the other end of the drum roasting is complete. Soaking the nuts in water overnight is found to reduce the likelihood of charring with this method. The oily smoke and acrid smell of the burning shells have an unpleasant effect on the nose and eyes of unseasoned visitors. As the fumes are so acrid, factories are often situated well away from residential areas.

The extraction of the kernels from the roasted nuts is done by hand, for no machine has yet been devised that will perform this operation in a satisfactory manner without a good deal of breakage of the kernels. In the factories in India this work is performed for the most part by women and girls who squat on the ground, each with a wooden baton and a flat stone embedded in the ground in front of her. Cracking the nuts is a task that demands great skill. Speed is an important consideration and it is very easy t break the kernel if too much force is use Sometimes a piece of hooked wire is us to help extract the kernel. The thin ligh brown or yellow skin which covers th kernels is easily removed by hand aft the kernels have been placed for a hour in drying-chambers. This dryin makes the kernels very brittle and easil removed by hand after the kernels hav been placed for a few hours in dryin channeleers. This drying makes th kernels very brittle and easily broke They are therefore spread out to absor a certain amount of moisture or placed i "sweating-chambers" before being grad ed according to size and finally packe for export. They are usually packed i 2 5-pound tins from which the air is ex tracted before being hermetically seale This method of packing prevents rancid ty or insect attack and kernels packed i this way have been found to show n deterioration, even after twelve month.

In grading, which is also done b female labour, the usual grades for ker nels are: (1) "wholes," (2) "halves, (3) "brokens," and (4) "rejects c spoilts" (including charred kernels) Only the first two of these grades ar usually exported and "whole" kernel fetch much higher prices than "halves. Broken kernels are frequently utilize locally, and the rejects and "skins" whic contain fragments of kernel for feedin poultry.

There are differences in the qualit and the size of kernels from differen areas. Good kernels are pure white plump, not twisted, fairly hard and witl a fair degree of sweetness. From som districts the kernels may be small or to hard and fibrous to be rated as firs quality.

The kidney-shaped kernels are generally consumed as "salted nuts" or substituted for almonds with which they compare very favourably. Uses have also been found for them in the manufacture of confectionery and sweetmeats of various kinds. The kernels have a pleasant, bland taste, and are slightly sweet. Some people use them in their own special dishes in a variety of ways in curries or stews, eaten with jaggery (palm gur) and coconut, or mixed with bean flour and fried in oil. Sometimes they are fried in coconut oil before eating.

In addition to the cashew nut the tree provides a number of useful products for the inhabitants of the countries where it occurs. The wood is useful for fuel and for charcoal, but is usually of unsuitable dimensions for other purposes. The acrid shell oil owes its blistering action to the presence of cardole and has various medicinal uses, especially in India. In European medicine it has also been used in preparations for removing worts and corns. Other uses are for treating fishing-nets and woodwork to prevent attack by termites or "white ants". In controlling mosquito larvae it has been found that this oil added to paraffin greatly increases the toxicity of the film. In recent years it has been used in the manufacture of plastics, and for certain sorts of paint such as are used for ships' keels, for cement surfac or where corrosive influences preclude tl use of ordinary paint.

The cashew "apple" or succulent bas part of the fruit may be eaten out of han but is rather tart or astringent as a rul and somewhat fibrous or stringy. Tl juice extracted from it provides a refresl ing drink or it may be fermented and wine resembling Madeira prepared fro it, also spirit. It is extensively used "cajuda" made from it is a popular bev rage. In fact the Brazilians are said to l the only people who fully appreciate tl cashew. They have varietal names f those trees that produce the largest ar finest fruits and utilize the "apple" pe haps more than the nut itself. It is common sight in parts of Brazil to s huge heaps of the "apples" piled up the markets when they are in seaso Vinegar has also been made from tl juice. In Goa spirit is regularly distille under Government control, from the fe mented juice of these fruits. Distillatic is also carried out in Portuguese Ea Africa, where at one time natives in certain area became so partial to it th it was said of them: "During the cashe season they give themselves up to the favourite beverage and become perfect useless".

# —Canning and Preserving with Honey

HONEY may be used in place of all or a part of the sugar used in canning, jelly making, preserving, and pickling. The milder flavoured honeys are probably most compatible with the less tart fruits for making sauces and jellies. The stronger flavoured honeys, particularly those with a spicy flavour, are excellent for pickling purposes and conserves made from tart fruits like gooseberries and rhubarb.

It is somewhat difficult to designate special honeys for special fruits as taste preferences vary. A home maker can best determine her family's preference by experimenting some. All honeys are good but not all flavours of honey are equally as pleasing to all individuals.

An all-honey syrup is naturally darker than a sugar syrup. Such a syrup tends to darken the lighter coloured fruits as peaches and pears when canned for sauce. However, the original fruit flavour is intensified. If one prefers a lesser degree of the original flavour of the fruit, it is better to replace only from one-fourth to one-half of the sugar ordinarily used with the honey.

In using honey, two precaution should be obtained:—

1. Since honey has a tendency t foam considerably when heated, there i some danger of the product "cookin over" at the beginning of the cookin period if a large enough preserving kettl is not used or the syrup carefully watched

2. Since honey is part water, it i necessary to cook the product in which it i used slightly longer in order to obtain th desired consistency.

**HONEY IN SAUCES**

For the syrup—Bring water to boilin point. Add the honey and stir. Agair let come to a good rolling boil. Remov all scum.

Canning by Cold Pack Method—Pour the boiling syrup over th fruit which has been packed in sterilizec jars. Process according to standarc schedule canning by hot pack method Add fruit to boiling syrup. Allow to come to a good rolling boil. Fill sterilized jars Process according to standard schedule. The following proportions of honey or honey and sugar to fruit for the various sauces are appended beliw:—

| Fruit | All Honey | Syrup. Honey and Sugar |
|---|---|---|
| Cherries (tart)<br>Plums (tart)<br>Apples (tart)<br>Strawberries | 2 cups honey<br>3¾ cups water | 1 cup honey<br>1 cup sugar<br>4 cup water |
| Pineapples<br>Raspberries<br>Peaches<br>Sweet black cherries | 1 cup honey<br>2 cups water | ½ cup honey<br>½ cup sugtr<br>2¼ cups water |

Be sure to remove all scum from the syrup before pouring over the fruit in jars or adding the fruit if the hot pack method is used.

**JAMS AND JELLIES**

Crab-apple, apple, plum, quince, and currant jellies can be successfully made by using ¾ cup honey to 1 cup of juice or half honey and half sugar may be used.

ALL-HONEY—Boil jellies 10 minutes. Add honey and cook to 220°F. Remove scum. Pour in hot sterilized glasses. Cover with paraffin.

HONEY AND SUGAR—Boil in Juice 10 minutes. Add sugar and bring to boiling point. Add honey and cook to 200°F. Remove scum. Pour in hot glasses and cover with paraffin.

**HONEY JELLY**

2½ cups honey, ½ bottle liquid fruit pectin. Mix honey and water in preserving kettle. Bring to full boil as quickly as possible. Add liquid pectin stirring constantly. Bring to full rolling boil. Remove from fire at once and skim. Quickly pour into hot glasses. Cover with paraffin.

**STRAWBERRY JELLY**

1½ quarts fully ripe berries, 4 cups honey, 3 cups juice, ½ bottle liquid pectin. Crush the ripe berries. Squeeze out juice. Drip through cotton flannel for sparkling product. Measure 4 cups honey and 3 cups juice in preserving kettle. Stir, bring to boil. Add the pectin, stirring constantly. Bring again to full rolling boil and allow to boil for 20 seconds. Remove from fire, let stand 1 minute, skim. Pour quickly into hot glasses. Cover at once with paraffin.

**CHERRY JELLY**

2 quarts of juice, 1 quart of honey. Crush cherries. Cook slowly without water till tender. Drip through cotton flannel. Measure 1 quart of honey to 2 quarts of juice. Boil until it double drops from the spoon. Remove scu[m] pour into hot glasses. Cover wi[th] paraffin.

**PEACH JAM**

3 pounds peaches, 2 cups honey, teaspoon allspices, 1½ teaspoons who[le] cloves, 3 teaspoons broken stick cinna[-] mon, 3 tablespoonfuls of lemon juice, cup peach juice. Put spices in cheesecloth sack. Cook slowly all ingredients until [of] desired consistency. Remove bag [of] spices. Place in sterilized jars an[d] paraffin.

**PRESERVES**

The following are the principal pre[-] serves prepared with honey:—

**SUNSHINE PRESERVES**

Allow 1 pound of honey for ever[y] pound of fresh fruit. Mix and spread o[n] platters. Place platters in box slightl[y] higher at back than front. Cover wit[h] glass. Place in sunshine on a bench. When preserves are thick, put in sterilize[d] jars and seal.

**APPLE BUTTER**

2 quarts cooking apples, ½ teaspoo[n] ground cinnamon; pinch allspice, 1 pin[t] honey (1½ lbs. or 2 cups), 1 tablespoonfu[l] lemon juice, 1 pint vinegar. Cook slowl[y] several hours. Stir frequently to preven[t] sticking and scorching. When thick, ca[n] in sterilized jars. Paraffin and seal.

**GINGER PEARS**

Wash, pare, core and cut into ver[y] thin slices hard under ripe pears. Allo[w] 4 pounds honey to 4 pounds pear slices Add ½ cup water. 1 ounce ginger cut int[o] small pieces, 2 lemons using the rind (Cu[t] in very thin strips.) Simmer all ingredient[s] very slowly. When thick as marmalade seal in hot sterilized jars.

**PINEAPPLE WATER MELON PRESERVES**

1 pound honey, ¾ cup water, 1 tea[-] spoon salt, juice of 1 lemon, rind of ½ lemon, ½ teaspoon ginger, ½ pound wate[r]

melon rind cut into small cubes. Simmer gently for 3 hours. Add 1 cup crushed pineapple. Cook 1 hour longer. Seal in sterilized jars.

**ORANGE MARMALADE**

3 medium size oranges, 2 cups honey (2 sups honey makes a heavy sweet marmalade—1¾ cups honey not quite so sweet), 1 cup water, 6 tablespoonfuls lemon juice, ¼ cup liquid fruit pectin. Run oranges through food chopper. Measure and you should have from 1¾ to scant 2 cups ground orange (skin, pulp, and all). Add water, simmer 15 minutes after it has come to good boil. Add honey, bring to a boil, then simmer 30 minutes. Add lemon juice. Add liquid pectin. Bring to full rolling boil and allow to boil 30 seconds. Remove from fire, skin by turns for about 5 minutes. This slight cooling should prevent floating fruit. Pour quickly in sterilized glasses. Paraffin at once.

**PICKLES**

Apple, peach and pear pickles are prepared thus:—3 cups honey, 3 cups vinegar, 2 cups water and 1 teaspoon salt. Bring these ingredients to a boil. Add fruit and cook till tender. Pack in sterilized jars and seal. For apples tie the spices in cheesecloth sack and boil in pickling syrup. For pears and peaches stick the whole cloves in the fruit and allow stick cinnamon to cook in the pickling syrup. Spices referred above consist of cloves and cinnamon. 2 to 3 whole cloves to each pear or peach, depending upon size of the fruit.

**CHUTNEY SAUCE**

2 onions, 1 green pepper, ½ cut hot red pepper, 3 green tomatoes, 2 tart apples, 1 cup raisins, 3 cups crushed pineapple, ½ cup vinegar, ½ teaspoon ginger, 2 tablespoons salt, 2 tablespoons mustard powder, pinch of red pepper, 1 cup honey, juice of 1 lemon. Run through food chopper the first six ingredients. the other ingredients and simmer sl for 2½ hours. Pack in jars and seal.

**CUCUMBER PICKLES**

2 quarts cucumber, ¼ teaspoon ci mon, ⅛ teaspoon allspice, 2 cups h 1 teaspoon celery seed. Mix spices, gar and honey. Let come to a boil. over cucumbers and seal.

**CAULIFLOWER PICKLES**

Remove outside leave and stalks, wash cauliflower thoroughly| Break small flowerists. Cook in boiling s water for 12 minutes. Rinse in cold v Pack pieces in hot sterilized jars. Fil jars with honey spiced vinegar prep as follows:—1 quart vinegar, ½ honey, 1 stick cinnamon, 1 teas celery seed, 2 small onions sliced, 1 spoon whole cloves, 1 teaspoon alls Boil this mixture 15 to 20 minutes. St and it is ready for pouring over c flower. Seal so while hot.

**HONEY VINEGAR**

There are various recipes for vin making but the following two have l found to be good.

I

2 lbs. of honey, 1 gallon of w Dilute honey with part of the water then heat to 200°F. Scald the barre crock in which vinegar is to be m Pour in diluted honey and add the rem ing water. Add a fruit juice to s fermentation. Cover with a clo woven cloth to keep out dirt and pre entrance of undesirable yeast or bact From 6 to 12 months are required for p per ripening. Use the purest w available to avoid contamination. If water is used, boil.

II

1 qart of honey, 8 quarts water, l together. Allow mixture to stand in warm places until fermentation cea Seal in clean jars.

# PLYWOOD: A GROWING INDUSTRY.

By S. K. Choudhuri.

PLYWOOD is an industry born of the modern demand for the maximum of beauty, utility and strength. It is difficult to give a comprehensive list of all the uses to which Plywood is put. In one word, it covers almost every phase of modern life.

Modern interior decorations of large flush veneer surfaces employing beautiful and valuable timber has been made possible only by the application of construction. The modern furniture with its elegance, strength and efficiency owes to a large extent to the use of Plywood or laminated panels. Plywood has been mainly used whenever lightness, and strength of construction are required.

The use of plywood and laminated boards has become so extensive that they are practically used in *aircrafts, ship*building, prefabricated houses, interior constructions, such as walls, ceilings, doors, etc. and from day to day the uses to which it is being put is increasing.

The recent research that has been going on in various parts of the world with adhesives for bounding plywood have been so great that to-day it is possible to manufacture plywood not only for interior uses but also for exterior purposes like building of aeroplanes, prefabricated houses, exterior doors, etc., in unlimited quantities. This has been possible due to the modern synthetic resin adhesives that are water-proof, boilproof, and fungusproof. The uses of plywood in decorative innovations are mural panels in the form of pictures made entirely from inlays of veneers out from different varieties of timber.

Though plywood as it is known today is a recent product there are evidences of the existence of 'veneering' dating back from 1500 B.C. The term "veneer" denoting a thin sheet of layer cut from wood, has also been traced to ancient Rome and Greece. In its simplest form, Plywood consists of three layers of thin wood firmly glued together with the grain directions of the middle layer at right angles to that of the two paralled outer layers. Laminated Board can be said as a recent development of plywood. In principle it is based on the same idea. Like plywood it is built up of layers of thin wood glued together. The essential difference is that thicker layers are used for cores for laminated boards than for plywood. It is now being more and widely realised that furniture or other panels constructed from plywood or laminated board are actually superior to similar articles made of solid timber.

In India the main outlet for the plywood industry is demand for tea chests. The quality of the Indian-made plywood is, therefore, judged by the suitability for the manufacture of tea chests. The essential requirements of the tea chests are:—

(a) The wood must not impart any taint to the tea, (b) it must be free from termite and borer infection, (c) the plywood must be strong and at the same time not heavy, and (d) it must be properly dried and glued with an approved cement in order to withstand deterioration in a tropical climate. According to the Indian Tariff Board Report (1947), the tea gardens complained very bitterly about the poor quality of the Indian tea chests, and also during the war period complaints were received from the Food Ministry in England that tea packed in Indian-made tea chests suffered considerable damage

and wastage on account of the defective quality of the tea chests. "When this complaint was investigated by the Forest Research Institute at Dehra Dun, it was found to be substantially correct. Two of the well-established factories have no doubt produced acceptable qualities while the majority of the factories have not satisfied the consumers on the point of quality. There is every reason to hope that the Indian factories can produce an acceptable quality if proper specifications are prescribed and the obligations are imposed upon the manufacturers to conform to those specifications," adds the rport.

With the development of the export trade in tea, India had to import in the past on a large scale, plywood from Europe for the purpose of making them tea chests. Until the outbreak of World War I, India had to depend entirely on foreign imports of plywood for making chests. The difficulties in the supply position caused by the cessation of imports of plywood during the World War I encouraged some enterprising firms to start a few factories for manufacturing plywood in the country. In 1917, at the request of Indian Munitions Board the Surma Valley Saw Mills undertook the manufacture of plywood, and in 1918 the Assam Saw Mills and Timber Co., was floated. This company got a 30-year lease for extracting timber from the north-etst frontier tracts. The real pioneers in the establishment of the plywood industry in India are the Assam Saw Mills and Timber Co., and the Assam Railways & Trading Co. Both these factories are located in Assam where suitable timber for tea chests is easily accessible. Assam being the largest producer of tea in India, these factories have also the advantages of the neighbouring markets for the tea chests. These factories started production between 1920, and 1924. The indigenous industry had, however, to face seric competition from foreign manufactur and had to apply to Government for p tection. There was a tariff inquiry 1927 but the recommendations of Tariff Board for the protection of the dustry were not accepted by the Gove ment. The revenue duty was raised 1931 from 8 per cent to 10 per cent. ( account of the keen foreign competiti the industry had to face difficult tir during the period 1930-39 and could r make much headway. In 1938 there w only three factories in existence, two which were in Assam and the third Kallai in South India. Just before t commencement of the second World W four or five new factories came into ex tence, the most important amongst th being the Plywood Products, Sitap The great expansion in the industr however, took place during the Wor War II when the number of factories, b or small, rose to about 80.

Accepting most of the recommend tions of the Indian Tariff Board last ye in regard to the continuance of Protecti to the plywood and Tea-chest Industr the Government have accorded the Indu try continuance of the protection for years.

It is no doubt a happy sign; but mu more has got to be done. The recomme dations requesting the Forest Researc Institute, Dehra Dun, to carry on researc for new adhesives should also be give a top-priority, so that the industry is n compelled to depend on casein alone f its glueing purposes.

The recommendation of the India Tariff Board (1950) for the setting up regional testing laboratories in Calcutt Assam, the Southern India, was mo welcome to the industry and attempt mu be made to collect funds for the purpo both by the Government as well as b

hose engaged in the manufacture of plywood in this country. The recommendations of the Tariff Board if properly implemented. Government would have no room left to allow the present recommendations to be side-tracked by interested parties and this essential industry will be in a position to prosper in no time and India will soon be made self-sufficient in her requirements of tea-chests.

## —TEST FOR MINERAL OILS.

WITH a view to detect the presence of mineral oil in vegetable oils attempts have been made to study a method which might prove handy for detecting the presence of the adulterant in the commonly equipped school laboratories and hospitals. The Director of Indian Agricultural Research Institute, Delhi has suggested the following test, which would enable mineral oil to be detected upto even 1% in vegetable oils:—

### HOLDE'S RAPID TEST FOR MINERAL OILS

Dissolve a piece of sodium hydroxide, the size of a pea in a large test tube of 100 C.C. Erlenmyer flask in a few drops of water and add 15 c.c. of absolute alcohol. To this solution add ten drops of the sample to be tested and boil vigorously for two minutes being certain that no unreacted oil remains on the sides of the tube or flask. Then add 50 C.C. of hot distilled water, a slight turbidity indicates the presence of mineral oil.

This test may slightly be modified to make it more handy. Instead of the large test tube of 100 C.C. Erlenmyer flask, a test tube ("6×¾") may be employed and 5 drops of the sample 7 C.C. of absolute alcohol and 20-25 C.C. of hot distilled water may be used in place of 10 drops of the sample, 15 c.c. absolute alcohol and 50 c.c. of hot distilled water. The test tube should be of heat resistant glass, the heating should be done with an air condenser. The absolute alcohol should be pure and give no turbidity with distilled water.

A air idea of the degree of adulteration with mineral oil can be obtained by determining the saponification value against a control sample of pure vegetable oil from the same source.

The following method may be adopted for the determination of saponification value:—

### REAGENTS

(a) Hydrochloric Acid....0.5 N.

(b) Alcoholic potassium hydro[illegible] solution:—

Dissolve 40 gm. of the purest KOH in 1 litre of 95% alcohol which has been previously redistilled from KOH over which it has been standing for some time.

### DETERMINATION

Weigh accurately about 2 gm. of the filtered sample into a 150 C.C. flask pipett 25 c.c. of the alcoholic KOH solution into the flask allowing the pipette to drain for a definite time. Connect the flask with an air condenser and heat on the water bath until the fat or oil is completely saponified (about one hour) cool and titrate with the 0.5 HCL, using phenophthalin indicator. Conduct a blank determination along with that on the sample using the same pipette for measuring the KOH solution and draining for the same length of time subtract the number of C.C. of 0.5 N. HCL obtained in the determination on the sample from the number obtained on the blank to obtain the C.C. of 0.5 of 0.5 N. HCL equivalent to the KOH used in the saponification of the sample taken. Calculate and report as saponification value or number (mg of KOH required to saponify 1 gm. of fat or oil.)

The saponification value of common edible oils and fat used for edible purpose is given below:—

| | S.V. |
|---|---|
| Mustard Oil | 169-175 |
| Groundnut Oil | 188-196 |
| Coconut Oil | 246-260 |
| Sesame Oil | 189-193 |
| Cotton seed Oil | 193-195 |
| Ghee | 220-235 |

# PHARMACEUTICAL RECIPES

## BORIC OINTMENT

| | | |
|---|---|---|
| Hard Paraffin | 27 | grams. |
| Soft Paraffin | 70 | ,, |
| White Beeswax | 3 | ,, |
| Boric Acid Powder | 10 | ,, |

Melt the first three together over water bath and sift in the boric acid. Stir and then remove from the source of heat but continue stirring until cold.

## COLD AND INFLUENZA MIXTURES

| | | |
|---|---|---|
| Ammoniated tincture of quinine | 1 | fl.dr. |
| Solution of ammonium acetate | 1 | ,, ,, |
| Compound tincture of cardamoms | ½ | ,, ,, |
| Glycerine | ½ | ,, ,, |
| Chloroform water to make | 1 | fl. oz. |

Mix.

## ASOKARIST

Bark of Saraca India (Asokatwak. 16 srs. Boil in 256 seers of water, down to 64 seers strain and add to the decoction.

| | | |
|---|---|---|
| Treacle (Guda) | 200 | palams. |
| Flowers of woodfordia flooribunda (Dhataki) | 16 | ,, |
| Nigella sativa (Krishnajiraka) | 1 | palam. |
| Cyperus rotundus (Mustaka) | 1 | ,, |
| Dry ginger (Sunth) | 1 | ,, |
| Beberis Asiatica (Darvo) | 1 | ,, |
| Roots of Nymphoea Stellata (Utpala Red Flower) | 1 | ,, |
| Chebulic myrobalans (Haritaki) | 1 | ,, |
| Emblic myrobalans (Amlaki) | 1 | ,, |
| Beleric myrobalans (Vibhitaka) | 1 | ,, |
| Kernel of mango seeds (Amrabija) | 1 | ,, |
| Cumin seeds (Jiraka) | 1 | ,, |
| Root bark of justicia adhatoda (Vasalka) | 1 | ,, |
| Red sandalwood (Rakta Chandana) | 1 | ,, |

## ELIXIR PAPAIN AND DIASTASE

| | | |
|---|---|---|
| Papain | 15 | grm. |
| Diastase | 15 | ,, |
| Solution amaranth | 3 | c. c. |
| Compound spirit of orange | 3 | ,, |
| Alcohol | 180 | ,, |
| Glycerin | 300 | ,, |
| Purified talc | 15 | grm. |
| Distilled water to produce | 1000 | c. c. |

Mix the compound spirit of orange with the alcohol, add the glycerine, talc, and 400 c.c. water. Use the mixture to make a paste with the papain and diastase, and allow it to macerate for 24 hours or more. Filter and add sufficient water to bring the volume well up to 1000 c.c. Add the solution of amaranth.

## PIMPLE LOTION

| | | |
|---|---|---|
| Crystallised alum | 1 | lb. |
| Sodium chloride | 1 | ,, |
| Sublimed sulphur | 1 | ,, |
| Sugar candy | 2 | lbs. |
| Spermaceti | 1 | lb. |
| Rose water | 3 | lbs. |
| Distilled water | 3 | ,, |
| Alcohol | 10 | ,, |

Reduce all the solids into fine powder and rub up with the mixed liquids. This lotion is to be applied at intervals during the day upon linen rags, which should frequently be charged. It is an effectual and quick remedy for eruptions on the face.

## THROAT PAINT

| | | |
|---|---|---|
| Glycerin | 85 | parts. |
| Tannic acid | 15 | ,, |

Mix and dissolve.

## ANTACID TABLETS

| | | |
|---|---|---|
| Calcium carbonate | 350 | gr. |
| Heavy magnesium carbonate | 250 | ,, |
| Sodium chloride | 100 | ,, |
| Simple Basis, as mentioned below | | q.s. |

Mix, and make into 100 tablets.
To prepare simple basis take

| | | |
|---|---|---|
| Sucrose, finely powdered 3 oz. | 231 | gr. |
| Acacia, finely powdered | 108 | ,, |
| Distilled water | | q.s. |

Mix to form into a paste with distilled water suitable for making tablets as mentioned above.

## INHALANT

| | | |
|---|---|---|
| Pine oil | 1 | dr. |
| Eucalyptus oil | ½ | ,, |
| Menthol | 30 | gr. |
| Alcohol isopropyl | 1 | oz. |

Directions: 2 or 3 drops on a handkerchief and the vapour inhaled.

## AQUA ANETHI

| | | |
|---|---|---|
| Anethi oil | 100 | mins. |
| Distilled water | 6 | oz. |
| Spirit rectified to make | 18 | ,, |

Dissolve the oil in 10 oz. of the spirit, add hot water. Shake well and set aside for a day or two. Decant and filter through 2 dr. of kaolin; then make up with spirit to 18 oz.

## TINCTURE CANTHARIDIN (B.P.)

| | | |
|---|---|---|
| Alcohol (90 p.c.) sufficient | | |
| Cantharidin | 0.1 | gram. |
| Chloroform | 10.1 | millilitres. |
| to produce | 1000 | ,, |

Dissolve the cantharidin in the chloroform, and add sufficient of the alcohol to produce the required volume.

## —Recipes for Small Manufacturers

### WHITE SHOE DRESSING

| | |
|---|---|
| Titanium dioxide | 20 parts. |
| Stearic acid | ½ part. |
| Trisodium phosphate | 1 „ |
| Casein | 5 parts. |
| Water | 75 „ |

Dissolve the trisodium phosphate and the casein in the water. Heat, and add the stearic acid, which has been heated to the melting point. Agitate until saponification is complete. Allow to cool, and add the titanium dioxide.

### CHOCOLATE PEANUT BARS

| | |
|---|---|
| Sugar | 3 lbs. |
| Liquid glucose | 3 „ |
| Water | 1 pint. |

Dissolve the sugar in hot water and mix the liquid glucose. Now cook to 240°F, then add 3 lbs of roasted peanuts, and cook for 10 minutes. Remove from fire, and roll out on slab. Cut into small pieces, and then dip in chocolate.

### TRANSPARENT LABEL VARNISH

| | |
|---|---|
| Copal | 4 oz. |
| Ether | 5 fl. oz. |
| Acetone | 5 „ „ |
| Alcohol 95 c.c. | 5 „ „ |

Mix.

### SHAMPOO POWDER

Sodium resqui carbonate, a compound intermediate in character between sodium carbonate and sodium bicarbonate, is the alkali par excellence for incorporation in shampoo powders. It may be used in quite large proportions. 40 per cent of soaps, 50 per cent of sodium resqui carbonate, and 10 per cent of borax form a good combination.

### CRYSTALLISED COCONUT CHIPS

Prepare the coconuts by passing off the brown skin. Cut them in thin slices and pack them in a crystallising tin. Now make simple syrup enough to cover them. Pour this syrup over them while hot and stand aside for 12 hours. Then drain off the superfluous syrup by removing the stopper from the tin. Spread the chips on trays and put them in the drying room for 2 or 3 days turning them over at intervals. When dry, put them again into the tin; boil a like quantity of syrup as before and let it stand till nearly cold, then pour it over the chips and let them remain undisturbed for another 12 hours; then strain again and spread them on trays, when dry, they are ready for sale. This, of course, will be white. To make the red chips, simply colour the syrup which is used for crystallising.

### NAIL ENAMEL REMOVER

The remover is a simply formulated article, consisting solely of a mixture of good nitrocellulose solvents.

| | |
|---|---|
| Amyl acetate | 20 parts. |
| Acetone | 60 „ |
| Ethyl acetate | 20 „ |

This may be performed if desired.

### EXPANDING ALLOY

| | |
|---|---|
| Lead | 9 parts |
| Antimony | 2 „ |
| Bismuth | 1 part |

Melt the lead in a crucible and then incorporate the bismuth and antimony. Use just enough heat to melt the lead. This alloy is good for taking impressions from dies, castings, and filling holes in metals.

### PRINTING INK FOR CELLULOID AND CELLOPHANE

Some difficulty is experienced in printing on celluloid. In Germany the inks are made by triturating pigments with linseed oil varnish, copal lacquers and cellulose solvents. But best results are obtained by printing on a dull surface and polishing afterwards.

It is not good practice to use ordinary inks, hence special inks are prepared. They are mixed with acetone, camphor, amyl acetate, etc depending on the cost of the ink or hardness of the celluloid.

In multi-colour work it is necessary to allow the first colour printed to dry-out before the second is applied. It is advisable to rub the celluloid sheets with alcohol or benzine before the second colour is printed.

When printing cellophane, inks used are being prepared by grinding with 10 per cent copal varnish and a drier.

The following formulas will produce good inks, when ground with suitable pigment:—

| | |
|---|---|
| Gum sandarac | 30 parts. |
| Gum Mastic | 10 „ |
| Camphor | 1 part. |
| Ethyl alcohol | 500 parts. |

Pigment—sufficient to produce paste.

Another solution is 1 kilogram gum sandarac, 1 kilogram camphor and 250 grams venetian turps in 5 kilograms of ethyl alcohol. This is also used as a varnish for printed matter.

The copal lacquers which are required for transparent foil are made thus:—

6 kilograms melted copal, 14 kilograms linseed oil varnish, 8 kilograms of oil of turpentine, 4 kilograms cobalt driers and 1 kilogram boiled linseed oil. The proportion for adding printing ink is 15 per cent.

# —IN THE FIELD OF INVENTION

### SUGAR WITHOUT MOLASSES

A recent patent taken in America describes a process for the manufacture of white sugar from sugarcane, sugar beets and citrus fruits without the formation of molasses (Sci. News-Letter, 1950, 58, 279). The product is claimed to have superior sweetening and improved nutritional properties. The process involves the treatment of sugar-bearing fluids and juices by chemical and ionexchange methods which remove salts and excess of undesirable gums, resins, dextrins and proteins present in the juices. The aqueous sugar solution after decolonization with activated charcoal or bone charcoal is concentrated into crystalline or powdered or liquid sugar.

### NEW BLOOD PLASMA

A new substitute for blood plasma, differing from one derived from okra recently reported by the Marquetta University at Milwanke is announced by the General Aniline and Film Corporation, Called PVP (for poly-vinyl-pyrolidone), the new plasma substitute is a synthetic chemical compound from certain protein substances and acetylene gas. It is said to have unusual properties when combined with certain ones, as for example, with iodine, which is not toxic when combined with PVP and can be taken internally and even be injected into the bloodstream. PVP can also be used in combination with drugs like penicillin. Such use enables the drugs to be retained in the human system longer than when used alone. It is also said to accomplish many of the effects of real pleasure.

—CHEMICAL AGE.

### NEW RAW MATERIAL FOR SYNTHETIC RUBBER

It is reported that a large volume waste product of the paper industry is a potential raw material which may replace or supplement styrene in the manufacture of GR-S synthetic rubber. The compound is para-alpha-dimethyl styrene (PADMS), produced as a by-product in the sulphite pulping of the spruce wood, and the potential supply is ample. It has been estimated that the U. S. A. and Canada will produce at least 1.3 million gallon a year. Synthetic rubber made from PADMS has proved superior in tensile strength and more like natural rubber in processing characteristic than rubber made with styrene.

—INDIAN RUBBER BULLETIN.

### STARCH ALDEHYDE RESIN FINISHING COMPOSITION

A new patent has been taken out by Scholten's Chemische Fabrickan (B. P. 634, 368). The patent claims for the development of a process for making dry starch preparations that dissolve in cold water but become insoluble when a solution is dried on a substrate. They are used as textile finishes or adhesives (e.g. in vensering wood). Cold-swelling starch (modified by partial oxidation or hydrolysis) is blended with an aldehyde and a substance other than an aminotriazine that can reach with it to form a resin. Thus the modified starch may be mixed with methyl olurea and acetic acid, or ordinary starch may be mixed with urea, then modified by heating, and subsequently mixed with paraform aldehyde and ammonium chloride.

—JOURNAL OF THE TEXTILE INSTITUTE.

### MEASURING SMALL TEMPERATURE CHANGES

A method of measuring small temperature changes in the range 0°-100°C has been developed, which has the advantage of sensivity and and simplicity. The detecting element is a toluene-mercury regulator modified so that the movement of the mercury in the capillary causes a change in the electrical capacitance between it and surrounding packet. The capacitance is connected in parallel with a capacitor in the input circuit of an oscillator working at about 250 Kc/S.

A separate heating oscillator of about the same frequency is used to develop a heat note which is applied to an andio-frequency meter. Both oscillators have a range of adjustment of about 50 Kc./S to enable the sensitivity, etc. of the instrument to be varied, and by building them closely together (though screamed electrically) temperature errors will be negligible since drift due to changes in ambient temperature will affect both oscillators simultaneously. Another practical point is to ignore the lower part of the output meter scale (approximately the first fifth), because when the two oscillators frequencies are almost identical they lock together.

Temperature changes of 0.001° can be recorded as changes of 0.2 m A on a 0-1 m A milliammeter, which has an almost linear temperature variation scale.

—INDIAN AND EASTERN ENGINEER.

### THIOMICID—NEW DRUG FOR TUBERCULOSIS

The synthesis of Thiomicid, p-acetyl aminobenzaldehyde thio-cemicarbazone, and antitubercular drug, is reported. A dilute solution of the drug—1: 50,000—has a bacteriostatic effect more marked than that of streptomycin. No tubercle bacilli were found in the spleen after the administration of 100 mg. of thiomicid. The treatment has been extended to tracheal and bronchial tuberculosis, tubercular infection of the kidneys, bones and joints and the skin, and fistula of the lymphatic glands. Thiomicid can be administered for several months without adverse after-effects (Chem. Age, 1950, 63,653).

## —FORMULAS, PROCESSES & ANSWERS

### TEMPERING IRON & STEEL

3295 T.M., Patal—Desires to know a process of tempering iron and steel and manufactring erasing rubber.

There are many methods of tempering steel; of these the following are more or less successfully carried out:—

One method of hardening and tempering steel is to heat in a flue of some kind maintained at the required temperature over the fire, and cool in water or a quenching or cooling liquid, and then to provide a tempering bath composed of some substances that will heat, in the open air to a temperature of about 150°F. Another method of tempering, which if capable of reduction to uniformity, would be the quickest and hence most desirable of any, is to heat the steel to a definite temperature, and cool or quench it in a liquid having sufficient greasiness or other quality which acts to retard its retraction of the heat from the steel, and thus give a temper at one operation. As an example of this kind of tempering it may be mentioned that milk and water, mixed in proportions determined by experiment upon the steel for which it was employed, has been found to give an excellent temper. A great deal, however, in this case depends upon the judgment of the operator, because very little variation in heating the steel or in the proportions of milk to water produces a wide variation in the degree of temper. If, on trial, the temper is too soft, the steel may be made hotter, or there may be more water added to the milk. If the steel was heated as hot as practicable without increasing the danger of burning it, more water must be added; while if the steel was made red-hot without being hot enough to cause the formation of clearly perceptible scale, the steel may be heated more.

### ERASING RUBBER

Some erasing rubbers are made from vulcanised rubber compound. Distinction is made between erasers for pencil marks and erasers for ink marks. In the former case the eraser should not damage the surface of the paper and the compound should have quite different properties from an ink eraser which can only function by removing the layer of the paper through which the ink has penetrated. Whilst in the case of the pencil erasers it is to the rubber itself that the erasing action must be attributed, the graphite being removed by its adhesion to the rubber, the other constituents of rubber mixing being mere diluents and cheapening agents, in case of ink erasers it is not so. Hence in making pencil erasers with pure rubber, fillers such as barytes, zinc oxide, etc. which are employed, are merely diluents and cheapening agents. But in case of ink erasers the rubber only plays the part of the binding material for the compounds such as ground-glass powder, pumice, emery, carborandum, sand etc which by their abrasive and scratching action tear up the paper and so remove it and its ink. Rubber compound for making erasers is usually sheeted on the two-bowl calender to a thickness of from 7 to 25 m.m. These sheets can be vulcanised in French chalk at a low temperature but they are more usually vulcanised in frame moulds in a hydraulic press. The vulcanised sheets are cut up into strips and the strips into smaller pieces on a cutting machine that is either operated by hand or is driven mechanically. The small pieces are shaken in rotating drum to round off the sharp edges and corners, freed from dust, stamped and packed. The surface of the erasers is frequently required to be unsmooth and embossed. For this purpose the unvulcanised sheet is cured in moulds, the metallic bottom of which are engraved with the desired des[illegible]

### CHEAP WASHING SOAP

2999 D.R.B., Chaibasa—Desires to have formula of making cheap washing soap.

I.

| | | |
|---|---|---|
| Coconut oil | 18 | lbs. |
| Mahua oil | 2 | ,, |
| Caustic soda lye 38°Be | 10 | ,, |
| Water | 35 | ,, |
| Soda Ash | 5 | ,, |
| Sodium Chloride | 1 | lb. |

Mix the coconut oil and the mahua oil. Place the mixture over fire, add lye when melted, stir well and let it remain there for about half-an-hour. Lighten the fire now and let boil slowly. When the lye begins to separate and the mass begins to bubble, add about 10 lbs of water and maintain the fire. Keep on stirring so that not one undissolved particle remains. Add the rest of the lye a few minutes later and keep on stirring the soap with a crutch. Now add half of the rest of water and add the other half with a solution of Soda Ash and Salt later on and let it boil awhile. Let drop a sample quantity and if you find that it has attained the requisite consistency it is ready otherwise it may be boiled still further. Any desired colour may now be added.

Such soaps do not serve much useful purpose. These dissolve readily. If these are sold while fresh these may prove profitable, otherwise these present a nasty appearance on getting dry.

II.

| | | |
|---|---|---|
| Coconut oil | 20 | lbs. |
| Caustic soda lye 38°Be | 15 | ,, |
| Soda ash | 5 | ,, |
| Soda Silicate | 8 | ,, |
| Water | 40 | ,, |

Mix the entire lye in the oil all at once and let it stand for half an hour. Now place over a fire and commence boiling it with the addition of the entire quantity of water. The boiling mixes up the oil and the lye put the soda ash and the silicate in their natural condition and stir thoroughly while the soap is being formed. This will be a better variety of such kind of cheap soaps.

## PHOTOGRAPHIC PRINTING PAPERS

3265 J.M.S., Borsad—Wants to have the recipes of making photographic printing papers.

| | | | |
|---|---|---|---|
| (a) | 4 per cent. cellaidin colladion | 620 | c. c. |
| | Sulphuric ether | 100 | " |
| | Alcohol (.796) | 30 | " |
| (b) | Silver nitrate | 25 | grains. |
| | Distilled water | 25 | c. c. |
| | Alcohol (.796) | 120 | " |
| (c) | Calcium chloride crystals | 4 | grains. |
| | Distilled water | 4 | c. c. |
| | Alcohol | 5 | " |
| (d) | Citric acid | 5 | grains. |
| | Distilled water | 5 | c. c. |
| | Alcohol (.796) | 30 | " |
| (e) | Castor oil solution (1 of oil in 2 of alcohol) | 15 | " |
| | Glycerine solution (glycerine 1; alcohol 2) | 15 | " |

Now add (b), (c), (d) and (e) to (a) in this order with thorough shaking. Coat on baryta-coated paper and allow to dry. The operation must be conducted in darkness. This gives a paper especially suitable for separate toning baths.

## LUSTRE POLISHING STICKS

3343 T.N., Trichy Desires to know a formula of preparing lustre polishing sticks.

*100 lb. oleo stearine and 20 lb. of double-pressed* stearic acid is placed in a kettle and melted by being brought to a temperature slightly above 130 degrees F.

To this hot mixture, add 5 lb. of triethanolamine and allow the resultant mixture to stand, while still hot, a sufficient time for thorough commingling and to enable the chemical reaction of saponification to be completed.

The above mixture is fed into a suitable mixing machine, which has been previously heated, and there slowly commingled with 220 lb. of tripoli powder and 180 lb. of powdered lint, this mixing operation generally requiring about one and one-half hours. The compound is transferred to suitable moulds in which it is allowed to solidify and harden into cakes of suitable size and shape for convenience in application to buffing wheels.

## ABRASIVE WHEELS

Abrasive wheels are made in various ways. One method which we describe below using shellac in a dry state and transferring the mixture to a hot mould where it is subjected to pressure. The heating is continued until the shellac has melted sufficiently to unite the particles of abrasive. The pressure is then released and the articles are baked in an ovan at a slightly higher temperature so as to complete the bonding process.

For small articles the cold mixture of abrasive and shellac is sometimes placed in an iron mould and stamped, rolled or compressed with an iron-shod tool. The very fragile articles are then baked at a temperature just sufficient to make the shellac viscous, the heating being continued as long as is considered necessary.

The proportion of bond required is usually from 5 to 7 per cent. of the weight of the abrasive, but larger proportions are sometimes employed.

The great advantage of shellac over all other bonds is the elasticity which it imparts to the wheels in which it is used.

## CAUSTIC POTASH

3353 I.S., Delhi—Desires to know a process of preparing caustic potash.

Caustic potash is largely used in the manufacture of soft soap. It may be prepared by decomposing a dilute solution of potassium carbonate with slaked lime. For this purpose one part by weight of potassium carbonate is dissolved in 12 parts of water, the solution placed in an iron or silver vessel provided with a lid, heated to the boiling point, and then milk of lime gradually added until a portion of the filtered liquid evolves no carbon dioxide when treated with an acid. The solution is allowed to settle, and the clear liquid drawn off into a well-stoppered vessel. This is then evaporated in a silver basin until the hydroxide begins to volatilise. In order to ensure the complete separation of the carbonic acid from the potash, not less water than that mentioned must be used, and the water which evaporates from time to time must be renewed, for when only four parts of water are present to one part of potassium carbonate no decomposition takes place. A concentrated solution of caustic potash is found to decompose carbonate of calcium. A certain portion of the caustic potash of commerce is prepared in this way. It is usually cast in the form of sticks which contain more or less water as well as all the impurities of the orignial potassium carbonate. It may be purified by dissolving in alcohol, and evaporating the clear solution to dryness in a silver basin.

Pure caustic potash may also be obtained by adding powdered potassium sulphate to a hot concentrated solution of barium hydroxide (baryta water) until a small quantity of sulphate of potassium remains in excess; this is then removed by a careful addition of baryta water; the clear solution is poured off from the barium sulphate evaporated in a silver basin, any baryta which remains in solution being deposited as carbonate by combination with the carbonic acid of the air.

## LIVER OF SULPHUR

3317 A.D.D., Bombay—Wants to have processes of preparing liver of sulphur, etc.

Liver of sulphur, which is employed medi-nally, is obtained as a greenish-yellow mass by melting 2 parts of potassium carbonate with 1 part of sulphur, and consists of a mixture of $K_2S_3$, $K_2 S_{04}$, and $K_2 S_2 O_3$.

## COPPER SULPHATE

Copper sulphate is obtained by directly dis-olving the metal in concentrated sulphuric cid; for this purpose copper and sulphuric cid are heated together. The metal is oxidised y a portion of the oxygen of the acid, while ulphurous acid escapes. The crude copper btained by smelting the ore, and con-aining about 60 per cent. of metal is treated with sulphuric acid. The resulting olution is evaporated in leaden vessels nd the clear liquid is left to crystallise in opper pans. From the mother liquor of the rystals, metallic copper is precipitated by means f iron, because the presence of a large quan-ty of iron sulphate renders this mother liquor nfit for further making of blue vitriol. This iethod of obtaining copper sulphate is the least xpensive but the salt is not quite pure.

## ILICATE PAINT

When the surface to be painted is of a ineral nature, such as the exterior of a house, ie pigments may be mixed with a vehicle con-isting chiefly of water glass, or soda or potash ilicate. This method of painting requires some are, and a knowledge of the chemical nature of ie pigments used. Some colours are complete-/ destroyed by the alkali contained in the water lass. Among those pigments which are not ltered by the alkali may be mentioned lime arbonate, baryta white, zinc white, cadium ellow, Naples yellow, baryta chromate, hrome red, red ultramarine, blue ultramarine, obalt blue, cobalt green, chrome green, ivory lack. When a wall is to be painted it should rst be prepared with a mortar composed of pure it lime and clean sharp sand. The water used hould also be free from saline impurities, as iese might subsequently effloresce and destroy ie surface of the paint. When the surface of iis plaster is dry, a weak solution of water lass should be applied, and the operation re-eated several times.

## MLA OIL

3416 A.C.P., Banaras—Desires to have a re-ipe of making amla oil and also Chyavanaprasa.

Take 2½ seers sesamum brayed to a paste, seers emblic myrobalan free from seeds and ruised, and 10 seers sesamum oil. Put the three ingredients together in an iron vessel and place in the sun for one month. Strain out only 5 seers of the soaking oil and put in a fresh lot of 5 seers sesamum oil. Leave aside for one month; strain out again 5 seers of oil and put in a third and fresh lot of 5 seers of oil. Re-peat the operation for 6 months. Then strain the whole of the oil and mix together the former quantities. Put in a covered vessel.

Amla oil prepared in this way serves as a good hair dye. Smear the head with it every day half an hour before bath. The hair will be dyed black and no grey hair will be noticeable.



## CHYAVANAPRASA

Chyavanaprasa, an Ayurvedic preparation so familiar among the people is composed of th following drugs:—

Barks of Aegle marmelos, Premna serrati folia, Bignonia indica, Gmelina asborea, Bignonia suaveolens, the roots of Sida cordifolia Hedysarum gangeticum, Doodia or Uraria lagopoides, Phaseolus trilobus, Glycine debilis, the piper longum, Tribulus lanquinosus, Solanum Zanthocarpum, Rhus Succedanea, Phyltanthus hiruri, Grapes, Caelogyne ovalis, Aplotaxis auriculata, Aquilaria agallocha, Chebulic myrobalans. Tinospora cordifolia, Riddhi (not being obtainable, Bala or Sida cordifolia is used). Jivak (Not being obtainable, Tinospora cordifolia is used), Rishabhaka (Bhumi Kushmanda or Bamboo Manna is used), Curcuma zerumbet, the tubers of Cyperus rotundus, Boerhavia diffusa, Meda (Withania sonnifera; not being obtainable Cassia fistula is used), Elettaria cardamomum, Nymphae stellata, Red sandal wood, convolvulus paniculatus, the roots of Justicia adhatoda, the root called Kakoli, & Leea hirta. Take one pala of each of these. Take also 500 fruits of Phyllanthus Emblica and tie them loosely in a piece of cloth. Boil all these together in 64 seers of water down to 16 seers and strain the decoction. Throw out the seeds of the myrobalans and taking the remnants of the fruits, fry them in 6 palas of ghee and 6 palas of sesamum oil mixed together. The fried product is then to be reduced to a paste on curry stone. After this boil the decoction and this paste, with 50 palas of sugar candy. When the boiled matter assumes some degree of consistency, throw into it bamboo manna 4 palas, the powder of Piper longum 2 palas, that of the bark of Cinnamomum zeylanicum 2 tolas, that of the leaves of Cinnamomum tamala 2 tolas, that of Cardamoms 2 tolas, and that of the flowers of Mesua ferrea 2 tolas, and stir the contents. When cooled, add 6 palas of ghee and keep the compound in a jar long in use for storing ghee. Dose.—½ to 2 tolas, vehicle being goat's milk. This is a nutritive tonic, useful in phthisis, and improves all conditions of debility.

## CHEMICAL SHARPENING OF FILES

Files that are not too badly damaged may be sharpened by immersing them in an acid solution. Prior to attempting to resharpen a file, it should be thoroughly cleansed of oil and other particles of dirt, preferably by the use of a

solvent. The files are then resharpened by immersing them for 20 to 25 minutes at room temperature in a solution composed of the following:—

| | | |
|---|---|---|
| Sulphuric acid | 7 | oz. |
| Copper sulphate | 2 | „ |
| Borax | 2 | „ |
| Water | 1 | pint. |

When the files are removed, they will be covered with a sludge. This should be removed by a vigorous wire brushing.

## ARTIFICIAL VELVET

Of the several methods of production the simplest is the use of a concentrated rubber latex dispersion. Practically any cloth is suitable for the fabric base, but of course, certain types are better than others. It is not unusual to give the fabric a preliminary light dressing of latex on one side. This promotes a smoth surface in the case of cloths which lack the required smoothness, and also prevents excessive shrinkage. Where a ligh weight fabric forms the base, or a waterproof product is required, a thorough initial coating is required. A representative formula for a suitable compound is as follows:—

| | | |
|---|---|---|
| Concentrated latex | 100 | parts. |
| Sulphur | 3 | „ |
| Zinc oxide | 5 | „ |
| Casein Solution (10 per cent) | 5 | „ |
| Accelerator (of D. C.) | ½ | „ |
| Antioxidant | ½ | part. |

Modifications of above may be necessary to suit particular cases. The initial coating is effected by a spreading machine, during which penetration of light weight fabrics is avoided by stretching and not exerting counter pressure. The spreading knife should always be fairly sharp, and set in the opposite direction to that in which the cloth is running.

The mix is then diluted with water and poured into the trough through which the fabric is running on a rubber roller. The level of the mix is adjusted so that it just reaches the surface of the fabric. The artificial velvet base then goes forward to the machine which applies the velvet dust on the still moist surface. Rotating sieves, preferably hexagonal in shape and or 1 millimetre gauge, carry the dusting media. They should cover the same areas. As the amount of dust they release varies with the amount they contain, both sieves should be in operation. When they are full or nearly empty, and only one operation when they are half empty, and therefore releasing most dust. About 6 times as much dust is shaken on the base as is finally required. Meanwhile the fabric is beaten quickly and regularly from underneath with flat instruments to insure that each individual hair assumes as perpendicular a position on the cloth as possible. The material is then left for about 10 minutes on a hot plate, or pressed over drums heated by approximately 5 lbs. of steam to dry it.

Brushing with soft cylindrical brushes takes place when the artificial velvet is quite cold. The superfluous dust removed by this process may be recovered and used again. Vulcanisation the final stage, is best carried out in a hanging position and heating for 10-30 minutes at a temperature of 140°C to 150°C.

Different effects may be obtained by varying the dusting media, silk, artificial silk, wool, and cotton dust are also used. The depth of pile may also be varied, and it is possible to emboss these artificial velvets. A similar process is used to produce cloths hardly distinguishable from mosquettes and suede.

## SHELLAC

3390 S.H.J., Bombay—Wants to know briefly the preparation of shellac.

Shellac is made by mixing a certain per centage of rosin with seed-lac. The rosin is ground and sifted, and 15 per cent of the weight of the seed-lac used, are added, and the mixed dust is inserted within a long cloth bag. One end of the bag is tied to a post and the other end twisted, while a fire is kept between under the bag. As the twisting over fire proceeds, the dust gets converted into a liquid form and comes out, and is gathered from the surface of the long bag, with brass plates or plantain leaf-sheaths, in the form of shellac. The long bag is only about 6 inches in circumference, but the length may be 15, 30, or 300 ft., according to the quantity of the dust treated. The shellac may be fused in pots into the shape of buttons. This is then known as button lac.

## INK FOR STAMPING ON BALLOONS

| | | |
|---|---|---|
| Nigrosin | 3 | grm. |
| Water | 15 | „ |
| Glycerine | 70 | „ |
| Alcohol | | q.s. |
| Lamp black | | q.s. |

Dissolve the nigrosine in the water; add a few grm. of alcohol, and then the glycerine. To this mixture add, with constant trituration, enough lampblack to make a thick cream. Dilute this to the desired fluidity with alcohol.

# —READER'S BUSINESS PROBLEMS

**[ Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]**

**STARTING A POULTY FARM**

**1543 L.M.P., Gangpur** — Will you please discuss the prospect of poultry farming in our town?

Many portion of India, where the rainfall is not excessive are admirably adapted to the breeding of fowls specially so where the soil is sandy, gravelly or filled with kunkur. I think your place will be suitable for poultry farming. Imported poultry keeping and rearing is progressing yearly. There is no reason whatever why you would not be able to be successful in poultry farming as place is favourable for starting a poultry farm but you should not depend too much upon your servants, who take no interest in the farmyard and are quite ignorant of what is necessary to its success. The greater number of stocks are killed off, not through climatic influences, but through want of care in the quality of water given to them to drink which should be renewed at least once or twice a day. It is most necessary that there should be sufficient room for the number of fowls kept, they cannot be entirely imprisoned and yet kept in a thriving and healthy conditnon. The fowl house and run must not be overcrowded, so the number of fowls to be kept will depend upon the size of the house and run. A house five feet long, five feet wide and six feet high is necessary for very large birds. More than five birds should not be kept in this space. The floor of the fowls run must be dug up once or twice every year to a depth of a foot, and great care must be taken to keep the place quite clean or else disease will soon break out in some form or other and destroy the fowls. Charcoal and ashes are beneficial and should be frequently scattered over the ground in the run and house.

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**A NEWS STAND**

**23 L.L.B., Dacca**—Writes. I have a capital of Rs. 500 which I have borrowed from one of my friends. Now I wish to start a business so that I can get a decent return. Will you please suggest a profitable business?

If you are very earnest for starting an independent business I would suggest you to begin your career as newsboy. First select a very suitable place preferably in the heart of the town. Then erect a news stand after taking necessary licences. This will cost you very little. The great advantage of this business is that it has no dead stock. Unsold papers and magazines are returnable. The publishers take the risk.

I think the capital you have got will be sufficient for starting the above business and you can earn decent living out of it. No one else in business makes as many profits on his capital as a newsboy does. You will also get good chance to develop your business. As soon as you secure enough capital you can put in a line of cheap novels and other books of common interest. You may also sell stationery articles required by School and College students.

For further developing your business you may put a signboard "You may order and book here".

As soon as you become acquainted with a customer, you can ask, "Is there any magazine that you would like regularly?". Most customers buy from several news stalls. Consequently you should try to secure all their trade.

You should remember if you can, what every regular customer wants, and hand it to him without being asked. That will help you to keep your customers.

Further this business has ample scope to be developed to a publishing house. I personally know some of the premier publishers who began their career as newsboy. But to prosper in this business you should stick to the business and do not leave it if you find any difficulty in the beginning and you are likely to make mistakes at first. But have ample self-confidence and perseverance. You must keep on and work hard.

# —BRIEF QUERIES AND REPLIES

**...tions of any kind within the scope of Industry are invited. Enquiries or replies from our ...s will be published free of charge in serial order. Questions are replied by post on receipt ... 8 stamps for each question. Subscribers outside India are requested to send two Inter-...nal Reply coupons for each question. In order to facilitate the work of Editor's Depart-... and to help prompt action the readers are requested to send enquiries in separate letters.**

...18 R.C.J., Kanpur—A formula of cement ...stic will appear in due course.

...19 S.B.S., Sirsi—Following is a process ...fying honey: For 3000 parts of fresh ..., take 875 parts of water, 150 parts of ... dried and pulverised charcoal, 70 ...of powdered chalk and the whites of ... beaten in 90 parts of water. Put the ... and the chalk in a vessel capable of ...ing ¼ more than the mixture and boil ...minutes; then introduce the charcoal and ...up the whole. Add the whites of eggs ... continuing to stir and boil again for 3 ... Take from the fire, and after allow-... the liquid to cool for a quarter of an hour, ..., and to secure a perfectly clear liquid ...filter on flannel. Betelnut cutting machines ... be had of Oriental Machinery Supplying ...cy Ltd., P12, Mission Row Extension, ...lcutta. You should pack cardamom and ... in tin cans which may be had of ...al Tin Box Manufacturing Co. Ltd., 1, ...nath Mitter Lane, Calcutta and National ...t & Metal Works Ltd., 36A, Sahitya ...shad Street, Calcutta.

...20 R.P.C., Colombo Process of manufac-...ing rubber paint will appear in due course

221 *B.R.C., Ambala Cantt. Process of manu-*...turing nitro-cellulose or cellulose nitrates ...ll be found in any book on artificial silk. You ... consult the Manufacture of Artificial Silk ... Wheeler.

222 P.C.S.R, Puri Following is a list of ...s dealers: Dinshaw & Sorabjee, Sealdah ...on, Jubilee Stores, 35, Park St., Calcutta; ... & Co., 195, Govindappa Naick Street, ... and Nathulal Mangal, 178, Anna Pillai ...t, Madras. Following is a list of spice ...nts. Banshidhar Dutt, 126, Khengrapatty ..., Calcutta; Brij Kishore Shah, 14-1, Rup ... Roy Street, Calcutta; Bishnupada Cha-...tty, 23A, Maharshi Debendra Road, Burra-..., Calcutta; Giridhari Saha, 231, Maharshi ...dra Road, Calcutta; Ananthalal Dhamani ..., 7, China Naiyakaran Street, Madras; ... & Co., 203, Govindappa Naick Street, G. ...Madras; Sirdarmall Seshamall, 47, Govind-... Naick Street, Madras.

223 S.K.G.S., Robertsonpet—For chalk stick ... materials enquire of Calcutta Mineral ... Co., Ltd., 31, Jackson Street, Calcutta.

...24 M.N.M., Panchmahal -We have no book ...ottery industry. You may consult Manu-... of Pottery by H. N. Ghose, published by ... Publishing Co., 1, Church Road, Bha-...dr.

225 H.C.I., Jhansi—Stream water which you ... in manufacturing phenyle is perhaps hard water so the disinfectant does not dissolve in it and does not become white.

243 U.E.C., Jubbulpore—Following is a list of timber merchants; Bharat Timber Industries, Sayani Road, Elphinstone Station, Bombay; Bombay Timber Importing & Landing Co., Colaba Chambers, Colaba, Bombay; M. Amratlal & Co., Tank Bunder, Reay Road, Bombay; Dutta & Co., 187, Maharshi Debendra Road, Calcutta; Ganges Timber Trading Co., 67-23, Strand Road, Calcutta; Imperial Timber Corporation, 59-60, Strand Road, Calcutta; T. Sashadri Iyengar & Sons, 8, Sembudos Street, G. T., Madras and T. Sampath, Sydenham Gardens, Sydenham Road, Vepery, Madras.

244 I.C.B., Bandra—Mantles are knitted from artificial silk fabric, cut into suitable lengths and stitched. These are next dipped in the following impregnating solution: Thorium nitrate 1000 parts; cerium nitrate 10 parts; magnesium nitrate 1½ parts; beryllium nitrate 5 parts; distilled water 2000 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 13 minutes according to the nature of artificial silk.

245 A.V., Kothapeta—For gelatine capsule enquire of Butto Kristo Paul & Co., Ltd., 1 & 3, Bonfield Lane, Calcutta.

*246 R.L., Sabarmati—Playing cards may be* had of S. A. Leonard Biermans, 13-1A, Govt. Place East, Calcutta; United Playing Card Co., Sadar Bazar, Delhi and Indian Playing Card & Carton Manufacturing Co., Lashkar, Gwalior.

247 G.S., Srinagar—Process of deodorising kerosene oil will appear in due course.

248 T.I.P., Kapadwanj—Wirenail, paper clip making machines may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta. Safetypin making machine may be had of Baird Machinery Co., Bridgeport, Connecticut, U.S.A.

249 B.T., Shillong—Process of making alcohol will appear in due course.

250 T.P.D., Ramnad—We have no book dealing with retreading rubber tyre. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta for the book.

251 A.K.D., Calcutta—Process of drilling

glass plate will be found in October 1949 issue of Industry.

252 D.M.P., Jaipur City—Slate and slate pencil may be had of Sri Vivekananda Swadeshi Slate Works, Markapur; Sree Jaya Bharathi Slate Works, Markapur and Markapur Slate Works, Markapur, Kurnool. Cycle and cycle parts may be had of Hind Cycle Ltd., Khachand Devchand Bldgs., 45-57, Apollo Street, Fort, Bombay; India Cycle Manufacturing Co. Ltd., 9, Tiljala Road, Calcutta; Jai Hind Cycle Works, Old Gurgaon Road, Paherganj, Delhi and Ranjit Engineering Works, Ludhiana. For rubber heels etc. enquire of Bhattacharya Rubber Works, 174, Jessore Road, Dum Dum; Bata Shoe Co. Ltd., Batanagar, 24 Parganas and Bombay Rubber Co. Ltd., 428, Kalbadevi Road, Bombay.

253 T.C.L.I., Salem — For lac enquire of the following firms: Bhagwati Prosad Agarwal, Ranchi; Indian Lac Co., Nirshachati, Dhanbad: and Badlikatra Lac Factory, Badlikatra, Mirzapore.

254 T.M.K., Lucknow—Following is a formula of vinegar: Molasses 1 gallon; acetic acid 4 lbs. Put the ingredients together into cask of about 40 gallons capacity. Fill it with rain water, shake it up and let it stand from one to three weeks and the result is a good vinegar. It is not possible to manufacture artificial tomato sauce. Process of manufacturing tomato products appeared in January 1951 issue of Industry.

255 T.S.L., Lakhimpur—For selling pineapples you may negotiate with Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Road, Calcutta. You may also advertise in Calcutta dailies.

256 S.K.M., Bombay—Yes, you may enclose any kind of advertisement matter in a same packet. You may consult Bombay Market, 21, Dadyseth Agiary Lane, Bombay and Calcutta Exchange Gazette & Daily Advertiser, 5, Mission Row, Calcutta.

257 K.S.W., Arantangi—Process of manufacturing sodium silicate will be found in Chemical Industries in India published from this office, price Rs. 3-9 including postage.

258 S.R.V., Bowringpet—An article on tamarind seed kernel sizing manufacture appeared in March 1951 issue of Industry. For pulverising machine enquire of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta and Marshall Sons & Co. Ltd., 99, Clive Street, Calcutta.

259 V.N.A, Kapurthala—All the machines you require may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta; Alfred Herbert (India) Ltd., 13-3, Strand Road, Calcutta and John Dickinson & Co., 6, Clive Row, Calcutta.

260 L.A.P., Bombay—For wooden [illegible] you may enquire of local wood engravers.

262 O.B., Ajmer—Caustic soda may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road and Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane,; both of Calcutta.

263 M.A.M.K., Porbandar—In order to cheapen candy freeze the water and dip in syrup.

264 G.S.D., Bombay—You should use potassium carbonate in making artificial [illegible]

265 H.L.S., Hathua—Refer your query to Basak Brothers. 20, Raja Manindra Road Calcutta 37.

267 H.N.B., Ahmedabad—Process of colouring celluloid sheets will appear in due course.

268 T.C., Mathura—For gramophone motors enquire of the following firms: Bengal Musical Mart, 24, Moti Sil Street; C. C. Saha Ltd., 170, Dharamtala Street; India Gramophone Mart, 16, Moti Sil St. and K. C. Dey & Sons, 161-1, Harrison Road; all of Calcutta

270 J.N.P.B., Russelkonda—Address of Borroughs Wellcome & Co. Ltd., Cook's Bldg Hornby Road, Bombay.

272 J H, Colombo—All the chemicals you require may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Allied Agency, 16, Bonfield Lane; both of Calcutta.

277 B.S.S., Ambala Cantt—Glass tubes to be used as a component part of dropper may be had of Indian Glass Blowing & Mfg. Co., 4, Ramratan Bose Lane; National Glass Blowing Concern, 9, Nayan Chand Dutt Street and Scientific Glass Apparatus Co., 5A, Prosanna Kumar Tagore Street; all of Calcutta.

278 N.S., Shiyali—Process of manufacturing peas cracker and crude crakers will appear in due course.

279 N.T.C., Bangalore—For gummed tape enquire of R. G. Pal & Co., No. 110/2, Grey Street, Calcutta.

283 S.C., Vizianagram City—You may use gum solution as preservative for gut.

284 G.L.K., Porbandar—Process of making slate pencil will appear in due course.

285 S.D., Calcutta—Limestone is burnt in a kiln and dehydrated lime is obtained.

287 B.S., Kalimpong—For drug licence and certificate write to Central Drugs Labora-

ry, Govt. of India, 110, Chittaranjan Avenue, alcutta.

296 L.I.S., Gauhati—We are not aware any florist magazine in Australia.

298 P.G.M., Cachar—You may consult tomobile and Carriage Builders Journal pub-shed by Ed. J Burrow & Co. Ltd., 125, Strand, ndon, W. C. 2 and Automobile Engineer, pub-d by Iliffe & Sons Ltd, Dorset House, ford Street, London S. E. 1. You may ate with the Automobile Association of 40, Chowringhee, Calcutta.

2 S.C.C., Rajmahal—Reply to your en-letter has been published in Query ns of "Industry".

3 A R., Etawah—Reply to your letter has nt by post.

S.O.M., Katni—For drums enquire of d Drum & Bucket Factory, 232, Bellasis Byculla, Bombay; Bengal Hardware & al Mfg. Co. 90, Netaji Subhas Road, Cal-and Imperial Drums Factory, Old Bay Co. Mills, Grand Road Corner, Bombay.

07 S D R., Manipur Road—You may consult Market, 2, Ramlochan Mullick Street, and Bombay Market, 21, Dadyseth Lane, Bombay.

08 M.V.R.C., Bangalore City—Process of facturing candles appeared in April, 1950 of Industry, price is 12 annas including stage.

312 T.C.C.R., Kapadwanj—Wirenail making hines may be had of Oriental Machinery lying Agency Ltd., P-12, Mission Row Ex-on, Calcutta. For other machine write to Machinery Co, Bridgeport, Connecticut. S.A Details of working the machines will be lied by the machine suppliers.

313 S R P, Jowai Sewing machine and machine parts may be had of Singer ing Machine Co., E-2, Clive Bldgs., Calcutta; Mullick & Sons Ltd., 77-13, Dharamtala Calcutta and Dutta Chaudhury & Co., Dharamtola Street, Calcutta.

316 J.C., Kanpur—You may practise as a eopath without undergoing any training in homeopathic institute but you have to study science privately at home. You may en-of Thacker Spink & Co. (1933), Ltd., 3, nade East, Calcutta for self filling fountain We are not aware of any such institu-You may undertake loan business. Yes, may appoint subagents if it is laid down agreement. We cannot advise you on circulation scheme.

317 B.C. Kalyan—Process of mercerising n will appear in due course.

318 D.L., Monghyr—Reply to your letter has been sent by post.

319 M.G., Tinsukia—You may apply the following black paint:—Amber 8 oz.; Linseed oil 4 oz.; Asphaltum 1½ oz.; Rosin 1¼ oz. and Turpentine oil 8 oz. Heat the linseed oil to boiling point, add the amber, asphaltum and rosin. When well melted remove from the fire and gradually add the turpentine oil. As turpentine oil is a highly inflammable substance, it should be incorporated away from the fire.

322 R.U.I., Kanech—Process of manufacturing pencil will be found in Industry Prize Article Vol. I, price Re. 1-15 including postage.

323 L.S.R., Proddatur—Small machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta and Batlibol & Co., Forbes Street, Fort, Bombay. Glass bottles may be had of Calcutta Glass & Silicate Works, 9, Kundu Lane; Krishna Silicate & Glass Works, 17, Radha Bazar Street and Victoria Glass Works, 130, Mechua Bazar Street; all of Calcutta.

325 F.C.P., Shikohabad—Hindi equivalent of pyrethri is not available.

328 N.B.C., Banaras—Refer your query to India Liaison Mission, Tokyo, Japan. Following is a list of toy manufacturers and dealers:—New India Toys & Novelties, 581, Matunga, Bombay; Satcowrie Dass & Co., 196, Old China Bazar Street, Calcutta and Shree Khunva Muralidhar Toy Works, 390, Sadashiv Peth, Nagpur City and Hari Charan Das & Co., 63-H, Radha Bazar Street, Calcutta. You may start mail order business with Rs. 1,000 in the beginning. You may negotiate with Registrar of Joint Stock Companies, P-29, Mission Row Extension, Calcutta.

329 B.P.V.R., Veeraghattam—Address of Turner Hoare & Co., Ltd., is 9, Clive Row, Calcutta.

330 P.L.J., Delhi—Following is a formula of motor grease: Take 10 lbs. quick lime, slake well with water and sieve free from grit. Stir in 30 lbs. rosin oil and allow to stand for 12 hours. Then heat to 210°F. stir well until a good homogeneous mass is produced. Then allow the mass to cool. By heating rosin grease with rather more oil a clear transparent, jelly like mass can be produced.

331 L.M.H., Daheri—Formulas of different varieties of solders will appear in due course.

332 K.K., Kotah—You may consult Chemical Industries in India published from this office, price Rs. 3-7 including postage.

**339 N.D.G., Bhiwani—Formula of plaster coating solution will appear in due course.**

**340 S.L.D., No address—You may dip the warm clothes in dry cleaning fluid and wash with clear water and dry in the sun.**

342 B.Z.J., Kanpur—For textile machines enquire of A. N. Sanyal & Sons, 76, Ramnagar, New Delhi; Apollo Engineering Co., 84, Apollo Street, Fort, Bombay; Bengal Textile & Engineering Co., 40-1, Strand Road, Calcutta and Britannia Engineering Co., Ltd., 28, Dalhousie Square, Calcutta.

343 B.G.A., Hyderabad—Process of manufacturing ginger morabba will appear in due course.

346 T.E.C R.G.W., Hindupur—Following is the process of preparing chicory powder: In order to prepare chicory, cut into slices the fresh root of wild succory or chichorium Intylens and expose it to heat in iron cylinders along with about 1½ to 2 p.c. of lard. Stir the slices frequently with ladle and remove them when they have been sufficiently fried. Now allow the slices to cool and afterwards grind them into powder in a mill. The addition of 1 part of good fresh roasted chicory to 10 or 12 parts of coffee forms a mixture which yields a beverage of a fuller flavour and of a deeper colour than that furnished by an equal quantity of pure coffee.

347 D.C.S.C., Hindupur—Vide No. 346 above.

351 M.E.W., Meerut—Following is a formula of iron casting crack filler. Iron fillings 98 oz.; Sulphur 1 oz. and ammonium chloride 1 oz. Mix well and use.

353 G.J.M., Ahmedabad—Process of manufacturing all sorts of rubber goods will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/9/- including postage. I think you have already got this book.

354 S.D., Meerut—Process of making chalk stick appeared in January 1951 issue of Industry.

355 I.K., New Delhi Essential oil is obtained by distilling rinds of orange and lime. We have no book on Foam manufacture. Nothing is added to aerated water to produce foam.

356 I.T.S., Bulsar—Following is a formula of thinner for cellulose lacquer: Acetone 80 parts; ethyl acetate 20 parts; ethyl lactate 20 parts. Mix and being volatile keep in well stoppered bottle. Following is a formula of cellulose lacquer: Scrap cellulose 5 parts; acetone 20 parts; butyl acetate 15 parts; ethyl alcohol 12 parts; ethyl acetate 15 parts; benzol 28 parts; butyl phthalate 1 part. hexalin 1 part. Mix.

358 B.N.T., Asansol—For tobacco le[illegible] write to Ashini Kumar Maity, 19, Raja K[illegible] Barabazar, Calcutta: Ambalal Kashibhai [illegible] 3K, Rupchand Roy Street, Calcutta; Golden [illegible] Tobacco Co., Guntur. Chandajee Kubajee & Co. Guntur and Commercial Tobacco Co., Gun[illegible]

359 S.S.S.C., Monghyr—For Bareilly k[illegible] write to Indian Wood Products Co. Ltd., [illegible] nagar, Bareilly.

360 B.D.C., Kanpur—Following is the [illegible] cess of manufacturing rubber solution: F[illegible] rubber cut in small pieces is placed in a b[illegible] of naphtha or benzene in the proportion [illegible] 1 part of the former to 5 of the latter. The ru[illegible] gradually swells absorbing the solvent and [illegible] tually losses its tenacity. Now the mass [illegible] vigorous stirring or the bottle on shaking [illegible] certain stage and this treatment repeated f[illegible] time to time, an apparently homogeneous s[illegible] tion is finally obtained. This rubber solution is very sticky and tenacious.

361 V.M., Kanchipuram—In manufactu[illegible] soap you should take caustic soda lye 18 s[illegible] and dilute it further by adding 4 sr. water. N[illegible] plance the oils on fire and when smoke rises [illegible] the lye slowly and stirring continuously w[illegible] the mass becomes homogeneous like honey [illegible] sodium chloride and boil for a while.

362 O.S.C., Telaprole Collapsible tubes may be had of Metal Box Co. of India Ltd., [illegible] Hide Road, Kidderpur, Calcutta.

363 R.V.S., Tindivanam—Formulas of s[illegible] pencil, water colour cake, etc. will appear [illegible] due course.

364 S.C., Pattukottai—Process of manu[illegible] facturing sherbat will be found in Manufacture of Syrup and Cold Drinks published from [illegible] office, price Rs. 3/7/- including postage. F[illegible] essences may be had of Paradise Perfum[illegible] House, 7, Colootola Street, Calcutta. You [illegible] consult Safety Matches and Their Manufactu[illegible] price Rs. 5/9/- and Manufacture of Soap, p[illegible] Rs. 4/9/- including postage.

367 S.L.D., Jhansi—All the chemicals [illegible] require may be had of Calcutta Chemical [illegible] Ltd., 10, Bonfield Lane and Allied Agency, [illegible] Bonfield Lane; both of Calcutta.

368 D.P.G., Pilani—Calcium chloride is [illegible] used on the large scale, but in the laborat[illegible] the anhydrous chloride is used for drying gas[illegible] and depriving organic liquids of admixed wat[illegible]

for this purpose it is better that it should be merely dried, as it is then more porous than when fused. Solutions of calcium chloride are used as baths for heating stone-ware stills and [illegible] apparatus liable to be cracked on the sand-[illegible]. As a medicine it has been used in scro-[illegible] and glandular diseases.—Dose, 10 to [illegible]

369 R.J.P.C. Ahmednagar—It is not pos-[illegible] to recharge exhaused dry cell. Formulas [illegible]ointment, snow, tansen pill will appear in [illegible] course.

371 B.W., Banaras -For chanras enquire [illegible] Banshidhar Dutt & Co., 126, Khengrapatty [illegible] and Calcutta Chemical Co. Ltd., 10, [illegible] Lane; both of Calcutta.

377 H.L.Q., Agra You may correspond [illegible] Thacker Spink & Co. (1933) Ltd., 3, [illegible]anade East, Calcutta and Chackravertty [illegible]atterjee & Co. Ltd., 4/3A, College Square, [illegible]utta for publishing your book.

379 F.I.T., Calcutta -Process of manufac-[illegible] magnet will appear in due course.

380 T.K.G.S., Ambur -Raw materials [illegible]quired for manufacturing tooth powder may [illegible] had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane; both of Calcutta.

381 B.J.F., Manipur Rd. -For selling [illegible] negotiate with the following firms: Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane; Dawn & Co., 11, Portuguese Church Street and Quamines (India) Ltd., 19, Strand Road; all of Calcutta.

383 B.N.S.V., New-Delhi Following is a list of Indian herb dealers: Drugs of India (Farmers) Ltd., 98-4, Netaji Subhas Road; Banga Lakshmi Bhandar, 13, Cotton Street; Banshidhar Dutt, 126, Khengrapatty Street; Indian Herbs Stores, 31, Mullick Street and P. C. Dawn & Co., 1, Mechua Bazar Street; all of Calcutta.

387 K.V.S., Bangalore City Process of enamelling copper wire appeared in January 1950 issue of Industry.

390 R.C.P., Dindori Process of manufac-[illegible]ing phosphorus will appear in due course.

391 B.M.I., Partabgarh - You may manu-facture rubber solution process of which will be [illegible]und under No. 360 above

392 M.T., Jugsalai -For selling waste [illegible]ather and rubber advertise in Classified Bar-[illegible] pages of Industry.

396 J.D.S.K., Palam Formulas of hair dye [illegible] depilatory cream and hair cream will appear [illegible] due course.

397 K.S.K.P., Kumbakonam Process of water colour brushes and oil colour brush will appear in due course.

399 S.S., Delhi—Distilled water does no[t] require further filtration. You may start foun-tainpen ink manufacture with distilled water

400 P.N.D., Calcutta—Lime stone when burnt in kiln is known as dehydrated or quicklime.

403 R.K.J., Rishra—Process of manufactur-ing aerated water will be found in Manufacture of Syrups and Cold Drinks published from this office, price Rs. 3/9/- including postage. For machine enquire of Essence & Bottle Supply Agency, 14, Radha Bazar Street, Calcutta. They will give detail information regarding manufacture of all sorts of aerated water.

408 E.K.R.M.K.M.R., Arantangi—For secur-ing import license you may write to Controller of Imports, New Delhi.

415 K.V.S., Bangalore—Process of manu-facturing enamelled copper wire will appear in due course.

416 D.S.C., Bangalore—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2 Hide Road, Kidderpur, Calcutta.

422 V.T.E.C., Bombay—For phenacetin powder enquire of Butto Kristo Paul & Co. Ltd. 1 & 3, Bonfield Lane, Calcutta.

424 M.M.M., Rangoon—You may manufac-ture lac bangles from lac and sealing wax; but the process is not available. You better consult a mistry efficient in manufacturing lac bangles. To communicate with any querist write him with number and initial care of Industry when your letter will be duly redirected.

428 P.C.W., Allahabad -Process of manu-facturing fountainpen ink will be found in April 1950 issue of Industry. An article on wax pencil manufacture appeared in February 1951 issue of Industry. A good formula of tooth powder will be found in March 1951 issue of Industry. Following is a formula of slate pencil: Powdered slate 60 parts; powdered lime stone 30 parts; sodium silicate 10 parts. Knead together all the ingredients to form a plastic mass and then force it through metallic tubes of suitable diameter fitted with piston. After-wards cut off into usual lengths and bake over a slow fire.

429 C.I., Kilakarai - Formulas of liquid gum will be found in April 1950 issue of Industry.

434 S.P.D., Patiala -Your first query is unintelligible. To check liquefying of duplicator in the summer season you may add barium sulphate.

436 M.S.C., Tiruchirapalli—You better advertise in newspaper for securing loans to finance a textile mill.

440 B.K.I., Kanpur—Carnauba and other waxes may be had of Calcutta Chemical Co. Ltd.,

10, Bonfield Lane, Calcutta and Banshidhar Dutt, 126, Khengrapatty Street, Barrabazar, Calcutta.

444 F.B.C., Amravati—Wirenail making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Wire may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta. Wire is a controlled article.

445 M.P.C., Rani, Rajasthan—Following is . list of kirana merchants: A. H. Bhiwandiwala : Co., 45, Anderson Street, Madras; Bhikaji labulal, 130, Varadhamuthiappan Street, ladras and Haji Ebrahim Kasam Cochinwala, , Anderson Street, Madras.

447 I.F.T.C., Bareilly—Refer your query to ie Minister in Charge of Local Self Government f Uttarpradesh.

449 M.A.A., Bhagalpur—We have no book n precious and semi-precious stone manufacire. You may write to Thacker Spink & Co. 1933) Ltd., 3, Esplanade East, Calcutta and W. 'ewman & Co. Ltd., 3 & 4, Old Court House treet, Calcutta. Following is a list of precious tone dealers: M. Lilaram & Co., A4, New Market, alcutta; Thakorlal Hiralal & Co., 9, Dalhousie quare, Calcutta; Hamilton & Co., Ltd., 8, Old ourt House Street, Calcutta and Gem & Co., reat Eastern Hotel Arcade, Old Court House treet, Calcutta and Chimanlal Kothari & Co., 91, China Bazar Road, Madras.

451 A.D., Motihari—Raw materials for soap anufacture may be had of Calcutta Mineral upplying Co. Ltd., 31, Jackson Lane, Calcutta. oap machines may be had of Small Machineries Ifg. Co., 22, R. G. Kar Road, Calcutta.

452 B.L.S., Sahibabad—An article on autoiobile rubbing compound manufacture appeared ı December 1950 issue of Industry.

453 G.L.S., Srinagar—It is not possible to echarge exhausted dry cell battery. Formula of oot polish appeared in March 1951 issue of ndustry.

455 K.V.N., Vellore—Following is a recipe f tea flavour:—Rose oil 4 drops; Neroli oil 34 rops; Cagnac oil 200 drops; Lemon oil 1½ oz.; 'anillin 5 oz.; Benzyl acetate 5 oz.; Ethyl forate 1 lb.; Amyl butyrate 2 lbs.; Ethyl acetate lbs. Mix and keep in stoppered bottle for use. 'rocess of blending tea appeared in November 949 issue of Industry. As regards packing you hould use airtight cans; and these cans should e artistic.

458 D.D., Coimbatore—Lemongrass oil is sed as a flavouring agent in soap and other preiarations. It is one of the cheapest flavouring gents available in the market. Ceylon quality rass yields good oil.

459 P.C.B., Howrah—An article on fountainpen ink manufacture appeared in April 1950 issue of Industry.

461 S.K.M., Rajkot—Brass and tin sheets may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta and Nandan & Co., 43, Netaji Subhas Road, Calcutta.

485 G.G.P., Mugunuwatawana—You may consult Pharmaceutical Preparations published from this office, price Rs. 3/9/- including postage.

486 A.K.D.S., Ludhiana—Formula of lighter appeared in August, 1950 issue of Industry.

487 S.T.A., Colombo—For jewellery box fittings enquire of the following firms: Sin· & Co., 38, Chandney Chowk Street; Bose, Bo· & Co., 184, Chandney Chowk Street; Calcutta Hardware Stores, 137, 138, Chandney Chowk Street and City Hardware Store, 104, Chandney Chowk Street; all of Calcutta.

489 P.P.R., Tirupur—You may use bisulphide of soda for refining jaggery.

490 M.B., Kamptee—For shot making machines enquire of Jessop & Co. Ltd., 93 Netaji Subhas Road and Francis Klein & Co Ltd., 1, Royal Exchange Place; both of Calcutta. For cut pieces enquire of the following firms: Bhaghatmal Surajmall, 16, Pagayapatty Street, Barabazar; Harendra Kumar Pyne, 203/1, Hrrison Road and Indian Textile Co. Ltd., Great Eastern Hotel Arcade; all of Calcutta.

491 N.J.V., Murtazapur—You should add salicylic acid to the gum solution to prevent decomposition and the proportion should be 1 part acid to 1000 parts of gum. It is not possible to manufacture bindi without gum which is one of the main constituents of bindi. Minerals you require may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, and Dawn & Co., 11 Portuguese Church Street; both of Calcutta.

492 G.R.B., Kurduvadi—For desiccated coconut enquire of the following firms: A. F Jones & Co. Ltd., Union Place, Colombo. Adamjee Lukmanjee & Son, 140, Grandpass Road, Colombo 14; Sherman De Silva & Co. Ltd., 23, Skinners Road South, Colombo and Saboo Chatoor & Co., 72, Hill Street, Colombo.

494 S.K., Khamgaon—We have no book on paint and varnish manufacture. You may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta for the book required.

495 M.D.D., Bombay—You perhaps mean benzyl benzoate which is used in perfumery as a solvent for artificial musk. Formulas of solvent oil will appear in due course.

# —REVIEW OF BOOKS

**INDUSTRIAL ACCIDENT PREVENTION by W. Heinrich. Published by McGraw Hill Book ıpany Inc., New York. Pages 470, price 00.**

Industrial accidents are matter of daily ırence in the industrialised countries. In ia also with the spread of industries and loyment of mechanical devices, the incidence ndustrial accidents is ever on the increase. spell considerable economic loss to the try in the shape of man-hour lost and heavy cost the country has to pay for page of work. Hence the subject of preven- of industrial accident demands careful ly in India where literature on the subject rather conspicuous by its absence. We ıld therefore draw the attention of our indus- lists to the book under review which makes ientific approach to the problem of pre- tion of accidents.

This is a scientific age when each day is ing the advent of new mechanical devices tools and hence it is not too much to ect that with a little care the majority of accidents may be preventible. A large nber of uncontrolled accidents annually ıld mean a sad reflection on our inventive ius and power of organisation. Herein lies usefulness of the volume under review.

The book makes a comprehensive study of causes of the accidents and their remedy a scientific way, and makes most interesting ding. It makes a scientific examination of basic principles of accident prevention and lains that the occurrence of an injury invari- results from a complicated sequence of tors the last one being the accident itself. s in turn is invariably caused or permitted the unsafe act of a person or a mechanical physical hazard. The unsafe act is again due inherited and acquired faults of persons, recklessness, nervousness, ignorance of practice, etc., Lastly, account should be en of the ancestry and social environment tor which may be responsible for the develop- nt of the above traits of character. The ident is merely one factor in the sequence l if this series is interrupted by the elimina- n of even one of the several factors that com- se it the injury cannot possibly occur.

The first step in the prevention of accidents ınd safety organisation for ensuring safety sures and direction and control of safety gramme. This includes imparting education the workers and provision of adequate first , medical and hospital facilities.

The second step is to find out the facts der which the accident has taken place. For s purpose each job is split up into its ele- ntary units listed in their proper order and n examined critically to determine the uses of the accident and if possible to analyse e safety potential of a particular job. The fety analyst examines each step of the job its process from its very beginning with res- ct to the method, machine or material involved any or all of them can be responsible for the cident.

The third step in the prevention of acci- dents is to analyse the facts disclosed by the fact finding investigation and draw conclusion from the assembled data.

Subsequent chapters are devoted in a prac- tical way to the selection of remedy on correc- tive action etc. and the application of the remedy which may be immediate and long term with large, number of illustrations have been given for understanding the principles involved. A course of action is determined by way of the remedy which will make the recurrence of the accident impossible. All these facts have been dwelt upon in separate chapters.

The remedial action in accident prevention has been grouped roughly in four categories:— (1) engineering revision which includes guard- ing of machines, their redesigning with a view to minimising accidents; (2) persuasion and appeal to workers for strictly confirming to the instructions in safe practices, etc.; (3) per- sonnel adjustment which means apportionment of labour with works that suit better; and (4) discipline and enforcement of rules under threat of heavy penalties.

Process revision may also be helpful in re- ducing the number of accidents and thus a separate chapter has been devoted to this. There should be a general realisatisation that processes under which accidents are possible are an indication of their inefficiency and re- quire revision.

Accidents again occur on account of negli- gence in wearing personal protective devices in handling or working near harmful objects. Similarly occupational diseases may be pre- vented by recognition of hazards. New products and methods require new methods of control of diseases caused by them and inciden- tal to industrial occupation or processes. This vital subject has also been studied elaborately.

Lastly there are chapters which deal with Safety Psychology, Industrial Fatigue, Illumina- tion and Vision, which are to be taken into serious account when prevention of accidents is to be ensured.

The book is an important addition on the subject of prevention of accidents and deserves thorough perusal by all interested in the line.

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**TRANSACTIONS OF THE INDIAN CERAMIC SOCIETY, Vol. IX. No. 2, October 1950. Published by the Indian Ceramic Society, Department of Ceramics, Banaras Hindu University. Price Rs. 6.**

This number deals elaborately with certain Indian and American clays in all their aspects e.g. colloidal behaviour, chemical and thermal analyses, microscopic examinations, refractori- ness, whiteware and translucent bodies with auxiliary fluxes. This study is made by Dr. M. L. Misra. There is also a short article on Kyanite Refractories for Glass Furnaces by B. K. and P. N. Agarwalla and another on Heating System in a Porcelain Insulator Factory in Japan by S. Deb (Jr.).

# NOTICES & REVIEWS

**(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this section.)**

**POCKET DIARY & CALENDAR**

We have received one pocket diary for 1951 and one calendar from Eastern Type Foundry & Oriental Printing Works Ltd., 18. Brindaban Bysack Street, Calcutta.

**FOREST BULLETIN**

We have received a copy of Indian Forest Bulletin No. 143 being the Interim Report on the Manufacture of Newsprint from Paper Mulberry by Chattar Singh. It describes the experiment carried out at the Forest Research Institute on this work for newsprint production. It is published by the Forest Research Institute, Dehra Dun, U. P. Its price is Re. 1/- only.

**AUTOMOBILE NEWS**

We have received a copy of the Annual number of Automobile News. It is fully illustrated with different models of motor cars and also the picture of the men who are doing business in this line all over India. It also contains several informative articles specially written for the benefit of the car owners and drivers. It is published by Gidwaney's Publishing Co., P. O. Box No. 6095, Colaba, Bombay 5 Price Rs. 2/-.

**TECHNICAL BOOKS (IN HINDI)**

We are glad to receive the following technical books in Hindi viz.

1. Soda caustic, Soap and Soap without Soda caustic. It deals with the manufacture of caustic soda, and soaps. Its price is Rs. 2/-.

2. Mirror Making: It deals with the detailed process of mirror making in simple language. Its price is Re. 1/-.

3. Candle Making: Describing the detailed method of candle making. Its price is Re. 1/8/-.

4. Sealing Compounds: It deals with the process of making sealing waxes and other recipes of sealing letters, bottles, etc. Its price is Re. 1/8/-.

5. Chemical Magic: Its price is As.-/10/-.

All the above books have been written by Prof. F. C. Trehan anl published by Hindusthan Industrial Association, Gurukula Kangri, Saharanpur, U. P.

**BLUE-BLACK FOUNTAIN PEN INK**

We have received from Pearl Industrial Work, 23, Telipara Lane, Shambazar, Calcutta 4, one phial of blue-black fountain pen ink which is found to be good.

**A BOOK ON ELECTRICAL ENGINEERING**

We have received a copy of electrical engineering book entitled "Electrical Distribution" by B. B. Pradhan explaining the subject with illustrations and numerous figures. The book is found to be useful to students, apprentices and others for all examinations of the standard of the final grade examination of the City and Guilds of London Institute. It is published by K. N. Gokli, Matunga, Bombay. Its price is Rs. 2/8/-.

**A DIRECTORY**

We are glad to receive a copy of Kahan Commercial, Industrial & Agricultural Directory of Tanganyika. It contains not only classified lists of traders, but it gives a vivid picture of the territory's natural resources both agricultural and mineral together with other useful informations. The directory will be found useful to those who intend to have business connection with that part of the territory. It is edited and published by E. E. Kahan, Post Box No. 9.., Dar-es-Salam, British East Africa. Its price 10 shillings.

# TRADE ENQUIRIES

**(To communicate with any party write to him direct with name and address given below mentioning Industry.)**

282 G. S. Kashyap & Sons, Patandi House, Daryaganj, Delhi—Want to be put in touch with the dealers interested in mathematical instrument box, students colour boxes and index files, etc. in Burma, Ceylon, Malaya, Siam, Batavia, Iran, Arabia, Persia and East Africa.

333 Sant Ram Verma, Government Contractor, Chhindwara, M.P.—Wants to be put in touch with the dealers in bristles and wants a financier to finance a good lucrative business.

338 Krishan Chand Bajaj & Co., 1500-I Azizganj, Bahadurgarh Road, Delhi—Want to be put in touch with the exporters in the Far East of M. S. black sheets.

493 S. M. Sharif, Idreesganj, Hardoi Wants to be put in touch with the suppliers of dry cow guts, and also with tennis and badminton gut manufacturers.

# PUBLICATIONS

MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

CALCUTTA, JUNE, 1951

# INDUSTRY.

***A Monthly Magazine for Manufacturers and Businessmen.***

**Published in the first week of the month by**
**INDUSTRY PUBLISHERS LTD.,**
**22, R. G. Kar Road, Calcutta-4.**


## EDITORIAL CONTENTS FOR JUNE, 1951




## BUSINESS NOTICE.

### SUBSCRIPTION DEPARTMENT.

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|---|---|---|
| Annual Subscription, Indian | Rs. | 6/- |
| Foreign | Sh. | 12/- |

Including postage, but excluding V.P. and Registration charges.

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| Single Copy (ordinary issue) | As. | -/8/- |
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Subscribers are enlisted at any time of the year for a period of 12 months. Subscribers will receive 12 issues in all beginning with the issue for the month of enlistment. Subscribers are not enlisted for any period less than a year.

Subscription money is always payable in advance or by V.P.P.

### ADVERTISEMENT DEPARTMENT.

Last day of accepting advertisement is the 10th day of the previous month. Any order for alteration or correction of copy is not entertained after that day.

Advertisement rates for ordinary and special position, both casual or contractual, are sent on request.

### CORRESPONDENCE.

All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

### OFFICE HOURS.

Editorial Department — 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays.

Subscription and Advertisement Department 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

## —CLASSIFIED BARGAINS

...RTISEMENTS under this head of small announcements cost 4 As. per word, minimum ... payable by Postage Stamp or M.O. with order. No vouchers given.
...Readers—In writing to advertisers the Readers are requested to write legibly and quote ...at they are writing in response to advertisement in INDUSTRY. This would ensure prompt ...tion. Letters to Advt. No. should be duly stamped.

**LIST OF CLASSIFICATIONS.**



## AGENTS WANTED

**For Calendars, Diaries, Handbags, Purses,** ... Gloves, Apply Bengal Leather Industries, ... St., James Square, Calcutta 67 AA

**Hooparin for Cough, Cold Whooping** ... and Asthma, Madhav & Co., Jorasan-... Calcutta 7. 66 AA

**Bangalaxmi Leather Works, 10/B, St., James** ...re, Calcutta—Wanted Stockists for money ...es and Ladies Hand Bags. 63 AA

**D. D. Malam—A soothing Ointment for all** ...iseases, never stains on clothes Wanted ...nts, Mahatma & Co., Jorasanko, Calcutta 7 80 AA

**Wanted Agents to Earn 500 Month-** ...ly for Embossers, Nameplates ...ocks ... ...ing machines Apply International Industries Aligarh. 69 AA

**For "Organisers and Agents" on suitable** ..., apply Oriental Provident Insurance ... td Canning Street, Calcutta. Phone Cal. 7775 76 AA

**Wanted Agents & Stockists for Plastic, Nut** ...ons & Alkathyne Cycle grips. Terms at-...tive. Oriental Products, 8, Masjid Bari Lane, ...para, Calcutta-36. 410 AA

**"Wanted experienced agents for India, Cey-...n & Burma to secure orders for Plastic Cycle ...dle grips & Plastic Buttons (Bush-shirt, ...nt & Coat)". Apply:—Eskey Industries, Hathi ...ate, Amritsar. 406 AA

## AGENTS WANTED.

**Wanted Sales Manager on Rs. 150/- P. M. in** every important centre. Watson & Co., 12, Netaji Subhas Road, Calcutta-1. 398 AA

**"Wanted Agents for our Embossers & Brass** Name Boards on commission basis. Apply to: O. D. Bros. & Co. Aligarh-10. 348 AA

**"Wanted District Sole Agents & dealers** Parties willing to invest against stock need Apply. Post Box 5549, Bombay-14. 388 AA

**Novelty Knives. Your Advertisements print-**ted on their blades, stockists wanted. Rajs Engineers, Gurmandi, Delhi. 315 AA

**Asian Transfer Picture "Jol-Chobi" 9/8/- for** 12 Gross. Packing sample against Re. 1/4/- Mukherji & Sons, P. O. Chandernagore, Hooghly. 400 AA

**"Wanted part-time workers everywhere** for selling effective Lice-Killer. Pay Rs. 60-. Apply Post Box 1573, Bombay. 389 AA

**Wanted Agents to secure orders for our at-**tractive Calendars. Apply to-day for agency terms. Empire Calendar Mfg., Co. P. B. 6734, Calcutta-7, India. 222 AA

**Wanted Agents, dealers on 30% commission** for pushing Malabaricum ointment—Specific for Sores, Cuts, burns, wounds etc. /7/- phial. Post Box 906, Calcutta-1. 230 AA

**Wanted agents to secure order for Chimni,** Jar, Empty Phial. Apply with -/2/- stamps. The Ganga General Glass Works, Chandausi (U.P.). 402 AA

**Wanted Agents for booking orders for silk** and cotton carpets. Apply to:—Parasakthi & Co., Post Box No. 13, Bhavani. (Via) Erode, S. I. Ry. 338 AA

**"Wanted Agents' for all kinds of Buttons,** Sewing thread balls, and other tailoring materials. Industrial Distributors P.O. Box No. 2505 Karol Bagh, New Delhi 5. 152 AA

**Wanted agents and stockists for Ayurvedic** medicines and patent preparations. Apply to Ayurved Research Institute, Santipur, Nadia. 326 AA

**Wanted Agents & Stockists for our Nargis** Khmam, Dilmohini Dana Zarda etc. On attractive terms. S. R. Industries, Ltd., 13-C, Palit Street, Calcutta-19 403 AA

**Wanted:—Commission Agents for "Favourite** Studs" and Plastic Buttons. Indian Button Traders. 9, Motilal Mitra Lane, Calcutta-11. —322 AA

**Wanted:—Agents, Stockists for a India** (buttons gold-plated. 3 years guaranteed. Terms attractive. Sample's cost Rs. 10-. Universal Traders 1-1A, Subol Chandra Lane, Calcutta-9. 6 AA

**"Wanted Inspectors and Agents on salary** and commission for selling our newly floated shares permitted by Central Government. The Peerless Life Assurance Co., Ltd., 35, Chittaranjan Avenue, Calcutta." 35 AA

**Wanted:—Wholesale Dealers for our own** make first class "Mullick" Brand Rotary Treadle Sewing Mechinees. Thousands are already in actual use with reputation. K. C. Mullick & Sons, Ltd., 77-13, Dharamtalla St., Calcutta. 72 AA

**"Wanted Stockists for high class fancy** wooden, Plastic, Tin, Enamelled toys and Enamelled Potteries, contact: Navbharat Company, 105, Chhotipeary, Banaras." 300 AA

## AGENCIES WANTED

**Agencies Wanted for Chemicals, Minerals, Paints.** Glass and all varieties of Raw and finished products. Dawn & Co., 11, Portuguese Church Street, Calcutta (Estd. 1906). 50 AG

**The Saraswat Corporation, Ltd., Mattancheri-Cochin,** solicits agencies from Hardware and Allied Manufacturers. Those interested please write. 381 AG

## BOTTLES & CORKS

**Santosh Distributors, A. T. Road, Gouhati, Assam.** Dealers & Stockists of glasswares, bottles & phials, corks, etc. of every description. 823 BC

**Bhagya Laxmi Glass Agency, P-33, Pollock Street, Calcutta--1.** Dealers in all sorts of Bottles, Phials, Corks, Caps, Capsules, Homeo phials, Glasswares, etc. 375 BC

**Nath & Bros., 67, Ezra Street, Calcutta.** Dealers in Empty Bottles, Phials, Corks. 61 BC

**We manufacture mould for glass wares** e.g. files bottles, etc. A. M. Banerjee, 34, Ezra St., Calcutta. 125 BC

**Ashini Kumar Dass & Co., 180, Lower Chitpore Road, Calcutta.** Importers of Bottles phials corks capsules, etc. 79 BC

**Radha Bazar Bottle Stores, 15, Radha Bazar Lane, Calcutta 1.** Dealers in Corks, Cork sheets, Cork Board Jointites, Cork Bungs, Granulated Corks, Cork Dust, Rubber Corks, Rubber Vaccine Caps, Alu Capsules, Lead Capsules, Paper Capsules, Bottles and Phials of all descriptions. 52 BC

**Krishna Silicate & Glass Works, Ltd., 17, Radhabazar Street, Calcutta.** Manufacturers of Bottles & Phials of every description. 60 BC

**Fancy White Bottles, Phials, Corks, Caps, Etc.** Enquire C. G. Depot, 18, Parsi Church Street, Calcutta-1. 90 BC

**Shanti Bottle Stores, 66, Ezra Street, Calcutta.** Importers & dealers of all sorts of Bottles, Phials, Corks etc. 91 BC

**Bimal Bottle Stores, 130, Radhabazar St., Calcutta.** Dealers & Importers of empty Bottles, Phials, Homoeo Phials, Glasswares & Corks of all description. 7 BC

## BRASS COMPONANT

**Brass, Castings, Washers, Machine Screws,** Buckles, etc. made to specification. Enquire: Panama Industries, 4, Commercial Buildings, Calcutta 1. 38 BS

## BOOKS & PERIODICALS

**For Old Copies of "Industry"...Apply:—A.** K. Mitter, 25/1H, Durga Charan Mukerjee St. Calcutta—3 379 BK

**Formulae Books for Perfumeries. English,** Guranteed, success Re. 1/-. Dr. M. Mookherjee, 17-4, Harrison Road, Calcutta. 411 BK

**Indian Hosiery Directory" complete list of** the Hosiery, Wool, Machinery, Yarns, Thread, Buttons, Dyes, Manufacturers, Merchants, Dealers. Price Rs. 10-. Journal's Publication, Ludhiana. 168 BK

## BATTERIES

**Dipti Battery Company, 6, Satchari Para Road.** P.O. Box No. 12006, Calcutta-2. Manufacturers of Dry cell Torchlight Batteries. Agents wanted. 206 BT

## CRUDE DRUGS

**Bansidhur Dutt, 126, Khongraputty Street, Calcutta.** Botanical Crude Drugs, Spices, Gums, Waxes, Camphor, Starch, Poisons, Heavy Chemi-

## CRUDE DRUGS

**P. C. Dawn & Co., 1, Machuabazar Street,** Calcutta. Botanical Crude Drugs for Allopathic, Homoeopathic, Ayurvedic & Hakimi Medi... 68 CD

**Bengal Herbs Stores, 2, Mullick Street,** Calcutta, Hingul (Mercury Sulphur Comp...), Murdasankha, Red Lead, Mercury, Belle... Liquorious Root, Raowolfia Serpentina, Se... Cinchona, Spices, etc. 101 ...

**Indian Herbs Store, 81, Mullick Street, Calcutta-7,** and S. D. Mehta & Co., Amritsar, H... and Drugs of all kinds. 20...

**Please write us for all kinds of Himalayan** Crude Drugs & Herbs. Danaratna & Chitt... na, Bhotahity, Kathmandu, Nepal. 39...

## CARBON BRUSHES

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**Loans Arranged on very easy terms.** Apply sharp to: M/s. G. S. Monga Ltd., Narshinhji Pole, Baroda. 96 ...

## FOUNTAIN PEN INK

**Sulekha Fountain Pen Ink, in no way in**ferior to best foreign ink, and even bett... than cheap imports. Contains "X-sol" a new solvent, Sulekha Works Ltd., Jadavpur, Calcutta-32. 392 ...

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## ICE-CREAM PAPER CUPS

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**We are the Pioneer Manufacturers of all sorts** ... strial, Mechanical, Phermaceutical, ... Machines & Tools, Pumps, M. S. Pipe ... of all sizes and Printing Machinery ... etc. Write for detail to:—Industrial ... & Tools Manufacturing Co., ... montalla Road, Howrah. 413 MA

**For Tannery Machines, Shaving Staking,** ... ing, Buffing, and drum. Write to A. M. ... 34, Ezra St., Calcutta. 125 MA

**Genuine Typewriting parts, springs and** ... les. Consult R. S. Typewriter Co., 12B ... Row, Calcutta 7. 78 MA

**... Trading Co., 9, Clive Row, Calcutta.** ... stockists for both new & 2nd Hand ... Boilers & other Machineries. 73 MA

**We Manufacture Biscuit, Lozenge, Soap,** ... and other industrial machinery and dies. ... chia Engineering Works, 90, Belgachia ... Calcutta 37. 2 MA

**We Make Machines for Making — Soap,** ... Biscuit, candle, Tablet, Ointment, Nail, ... Buckets, Tin-containers, Cardboard ... also Printing, Book Binding, Agricul- ... Wood Working, etc, Machines, Oriental ... Supplying Agency, Ltd., P-12, Mission ... nsion, Calcutta 1. 26 MA

**We Manufacture Soap, Biscuit, Lozenges &** ... tionery, Plastic, Tablet, Book binding, ... mould etc. *Various Industrial machines* ... Booking throughout India and Pakistan ... demonstration Vulcan Machine & ... 66, Maniktala Main Rd., Cal. 11. 409 MA

**Best Machines in the Market—Build your** ... with industrial machines manufactured ... factory under expert supervision. These ... machines for the manufacture of Soap, ... s, Biscuits, Chocolates, Tablets, Phar- ... als, Chemicals, Paints and Pastes, ... Sticks, Sealing Wax, Candle Mould, En- ... Plastics, etc., etc., Our machines will ... Standard Products and run smoothly ... years without troubles. **Small machi-** ... **Manufacturing** Co., 22, R. G. Kar Road, ... zar Calcutta. Phone: BB 3858. 124 MA

**We manufacture Pipe-fittings of all sizes** ... M. S. Bonner & Co., Ltd., 29-7, ... gha Dutta Lane, Howrah. 414 MA

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**Tulsiraj Oil—Sure Cure for Hernia, Hydro-** ... Elephantiasis, Scrofula Rheumatism. @ ... Kaviraj, Nagendra N. Dey 1, Bhim Ghose Lane, Calcutta—6. 170 MD

**Tiger Fat for Rheumatism, Gout, Pain** ... lysis, Re. 1-4 per tola. Lotus Honey—for troubles Re. 1-8 per dram. Sil & Co., 344C, ... r Chitpur Road, Beadon St., P.O. Calcutta. ...

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**"For guaranteed cure against Anaemias all** types, Blood deficiency, Low Vitality, use Hemo-phosph-Folic. Rs. 6/- each, three bottles **Rs. 18/-** eighteen, post paid. Broncure against Bronchitis, Cough, & Cold. Rs. 3-2-0 each, three for Rs. 9-6-0 post paid. Manufactured under rigid Drug Control, no home should be without these sure specifics. Remittance with order to;—Chandulal Nanavati & Co. 233, Laxmisadan, Thakurdwar Road, Bombay 2. 366 MD

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## OPTICAL GOODS

**High Class Metal frames for Spectacles** manufactured by the Olympia Optical Factory, Bunder Road, Karachi. 129 OG

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**Dutt & Co., Patent Design and Trade Mark,** Agents. Prompt and efficient services guaranteed, 82, Harrison Road, Calcutta. 70 PT

**Wanted—Shares Agents under writers** throughout India, Pakistan & Burma—Gopal-krishna Litho & Type Works, Sardar Mahal, Bhopal, M. B 387 PT

**For Registration of Trade Mark, Name,** designs and Labels etc., write to the Calcutta Registration Agency, 39, Neogipukur Lane, Calcutta 14 (Estd. 1921). 212 PT

## PRINTING & STATIONERY

**St. Ford's Banking (for record), Fountink** (for Pens), Stickal (Country Gloy), Rubber Capsuled Mucilage, etc. Chemproducts Ltd., 12, Tamer Lane, Calcutta 9. 39 PS

## PERSONAL & PROFESSIONAL

**Good News. Those who wish a male issue** instead of female should atonce write for particulars enclosing one shilling B.P.O. to Burma Co-operative Medical Stores, 103-105, Sule Pago-da Road, Rangoon. 401 PP

## RADIO & ELECTRIC GOODS

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## SPRINGS

**Sheffield Spring & Steel Co., 135, Canning** St, Calcutta. **Springs** of all kinds and hines parts. **Phone: Bank 3974,** Telegrams: sko. 77 SR

**Modern Engineering Works—Manufacturers** Springs & Spring Washers—Govt. & Rly. pliers. 12, Jadu Pandit Road, Calcutta—6. 12 SR

**For quality springs, enquire of British** a Spring & Steel Co., 67B, Netaji Subhas d, Calcutta. Telegram—Springsman, Phone k 3154. 64 SR

## SALE & PURCHASE

**"Execute Purchases Sales through us en-** ies solicited. Apply National Distributors, Azadmaidan, Bombay." 408 SP

**"Wanted buyers for East African Chillies** all). Apply Amarnath, Box 1231 Mombasa." 412 SP

## SCIENTIFIC APPARATUS

**S. K. Biswas & Co., 137, Bowbazar Street,** utta 12. Manufacturers of Scientific and oratory Glass Apparatus. 345 SA

**N. G. B. Concern Ltd., 9, Nayan Chand Dutt** Calcutta 6, manufacture Ampoules, Test-s, Homoeo Phials, etc. 143 SA

**Medico Chemical Laboratory, 8A, Raja Naba** sen Street, Calcutta. Manufacturers of test s, glass syringes, ampoules, lactometers. 111 SA

**Scientific Glass Apparatus Co., 5A, Prosono** nar Tagore Street, Calcutta:—Manufactur-of Ampoules Test tubes, Hydrometers, Glass paratus of all description for Hospitals, Col-s & Laboratories. 62 SA

## SOAP MATERIALS

**H. L. Shome & Son, 30/3/A, Darpanarain** tore Street, Calcutta—7. Suppliers of Soap erials. 88 SL

## SPORTS, ARTS & MUSIC

**Sports Goods and Boot Lasts at cheapest** es. Send trial order with advance to M/s. S. Kwatra & Co., Basti Sheikh, Jullundur. 386 SM

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**Stamp Collectors. Please send your** name & Address in the Directory of Stamp Colle... S. L. Matthew & Sons, Karol Bagh, New D... 377 ...

## SITUATION VACANT

**Wanted Branch Manager on Rs. 150/-** P. M. in every important centre. Builders & In... tors Ltd., 12, Netaji Subhas Road, Calcutta. 399 ...

## TEA & CONFECTIONS

**New Bengal Tea Co., P221/1, Strand** Bank Road, Calcutta. Wholesale dealers in tea. T... gram:— "BANGLACHA." 3 ...

**B. K. Saha & Bros., Ltd., 5, Pollack** Street, Calcutta. Dealers in wholesale Tea Tr... Telegram: "Holselti," Telephone Bank ... 4920. 68 TC

**Tea Chamber Ltd., Darjeeling. Branch** 210, Harrison Road, Barrabazar, Calcutta 7. Ph... B.B. 797. Wholesale & retail dealers for ... sorts of loose and packet teas. 109 TC

## TIN BOXES.

**Bengal Tin Box Mfg., Co., Ltd., 1, Jadu** Mitter Lane, Calcutta—4, Phone B.B. 3030. Manuf... turers of Printed Tin Containers of all descriptions. 40 TB

## WEARING APPARELS

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**Assam Endi Chadder, Muga, Pat** available. Free delivery, write to:—Arjanalya Pictu... Palashbari, Assam. 301 ...

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# NATIONAL INCOME ESTIMATION

THE importance of estimation of the national income of India has been long realised and attempts had been made at different times by eminent economists and satisticians to estimate the aggregate national income of the country.

As the previous estimates are all out-dated a Committee was recently formed with Prof. P. C. Mahalanobis as Chairman to prepare a report on the national income and related estimates. As the correctness will greatly depend upon relevant data and essential statistics, the Committee was asked to suggest measures which could be adopted from now for improving the quality of the available data and statistics.

The chief difficulties which the Committee encountered in framing the estimate included among others : (1) lack of empirical data; (2) absence of a uniform basis for evaluating commodities and services in terms of money; (3) absence of practice of keeping accounts by producers and consumers; and lastly (4) incidence of household enterprises as the major part of the Indian economy.

It goes to the credit of the Committee that notwithstanding these obstacles, it has been successful in submitting a preliminary report containing various illuminating facts and figures associated with the national income for 1948-49 and proposes to issue a further report with greater details towards the end of the year.

In calculating the national income, the Committee has classified the principal earners and their working dependants under the following heads : agriculture, animal husbandry, forestry, fisheries, minerals, industry including small enterprises, trade and transport, the professions and liberal arts, Government services and domestic workers. Estimating the net output of the different sectors of Indian economy and adding to this the net earned income from abroad the Committee comes to the figure of Rs. 8710 crores as the national income of India which when distributed among 34.104 crores of people gives the per capita income of Rs. 225/- which though numerically higher than the previous estimates will in view of the heavy rise in the index of commodity prices mean a sad deterioration of living conditions in India.

### PAPER INDUSTRY IN INDIA

The total production of paper by the paper mills in India during 1950 is the highest on record to date and exceeds the figure set for the Industry by the Target Production Committee of 1,10,000 tons by some 400 tons odd. It is understood that extensions to productive capacity and the rehabilitation of existing plant have taken place during the year; and for the next few years, if all goes well, production of Indian made paper will increase by several thousand tons annually, and possibly more if world political situation does not deteriorate.

But how long the mills can maintain to-day's prices is uncertain as apart from the increasing demands of labour, mill's costs of production are mounting in other directions. Prices have gone up for the principal raw materials e.g. bamboo and sabai grass and also for caustic soda, bleaching powder, casein and general mill stores. Prices of the essential imports show a very steep rise, that of sulphur being simply colossal. The events of Korea have delivered another few turns to the wheel of inflation.

In other parts of the globe the demand for pulp and paper has skyrocketed prices to a high altitude but as a result of Government fostering the industry over a period of years by its encouragement the use of bamboo for the production of pulp, the paper merchant in India is in the happy position of purchasing his supplies of paper at more modest rates than elsewhere in the world. It is necessary that more thought is paid to bamboo as the fibre of the future, which may really oust the soft woods from their position of eminence.

Besides bamboo and grass which are mainly employed, rags, hemp and hemp ropes all play their part. Indeed, one paper mill in India solely uses hemp an[d] ropes. Owing to stock piling efforts, al[l] of these materials are being exported fro[m] the country at ever increasing prices wh[ich] the Indian papermaker cannot afford t[o] pay without serious repercussions a[ll] round. It will be advisable for India t[o] retain these materials for conversion int[o] paper within the country than to hav[e] portion returned in the shape of paper a[t] a much higher price? Moreover present Forestry matters are the conce[rn] of the Government of the States who[se] policy is to derive the highest possible pri[ce] in the shortest possible time by means [of] annual auctions of forest areas. But th[is] policy should be otherwise and it is nece[s]sary to look to the future before ou[r] forests are too heavily damaged. Th[e] remedy seems to be long leases eith[er] direct with the mills or approved contrac[tors] so as to encourage the proper work[ing] of areas on a rotational basis [of] cutting.

### FOREIGN INVESTMENTS IN INDIA

According to a recent assessment [of] India's foreign assets and liabilities b[y] the Reserve Bank of India, foreign busi[ness] investment in India on privat[e] account, as it stood on June 30, 1948, h[as] been estimated at Rs. 397,86 cror[es]. This investment which has been calculat[ed] on "book value" would amount [to] Rs. 596.44 crores when converted on [a] market value basis.

Most of the business investment is [on] a long-term basis, constituting near[ly] Rs. 519 crores or 87 per cent of the tot[al] investment. The remaining 13 per ce[nt] represents mostly short-term liabilities [of] commercial banks.

Among the countries the nationals [of] which have invested in India, U. K. lea[ds]

with a total of Rs. 376 crores. Next comes U. S. A. (Rs. 30 crores), Pakistan Rs. 21 crores); British West Indies Rs. 15 crores); Switzerland (Rs. 10 crores) and Canada (Rs. 9 crores). The rest comprising about Rs. 135 crores is shared by various other countries. Trading and manufacturing concerns as well as plantations, managing agency companies constitute, by far, the major field of foreign investment.

Recent investments, after India became free, show that during the three years beginning 1948, a total sum of 10.47 crores was invested by foreigners in various industries in India including automobiles, bicycles, textile machinery, sewing and gramophone needles, electrical non-ferrous metals, agricultural machinery, paints, paper and boards, chemicals, drugs and pharmaceuticals, leather goods, raw film, woollen, vanaspati sports goods, photographic materials and food. Among the countries which have invested during this period are U.K., U.S.A., Canada, Ceylon and Switzerland. A Swiss firm is considering schemes for starting machine tool factory for India to be set up in Bangalore and a Swedish firm is offering technical assistance for the establishment of a Penicillin Factory. Technical assistance would be available from the Standard Cable Company of U.K. for setting up a Telephone cable factory in this country..

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### NATIONAL INCOME OF INDIA

The National Income Committee was set up to prepare a report on national income and related estimates of India, to suggest measures for improving the quality of available data and for collection of further essential statistics and to recommend ways and means of promoting research in the field of national income. In order to benefit from the experience of similar work in other countries, the Government of India also made available to the Committee the advice of three distinguished foreign experts on national income viz. Prof. Simon Kuznets of U.S.A., Prof. J. R. N. Stone of U. K., and Dr. J. B. D. Derksen of the United Nations, who came to India in December, 1950.

Already considerable progress has been made by the National Income Unit in its investigation work and a provisional estimate of national income for the Indian Union for the year 1948-49 is available. The computation of national income is, however, a continuing process and has to be carried on from year to year without a break as it has a vital bearing on the formulation of economic policies. It is, therefore, encouraging to learn that it is proposed to continue the National Income Unit in the coming year also.

An analysis of the statistical table shows that the net output per engaged person in agriculture is Rs. 500/-; mining and factory establishment Rs. 1700/-; small enterprises Rs. 600/-. commerce, transport and communications Rs. 1600· professions Rs. 600/-; Government services Rs. 1300/-; domestic service Rs. 400/-. It further appears that out of the total estimated national production, no less than 53 per cent. covers the consumer expenditure on food, which shows the underdeveloped character of our economy.

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### SOAP INDUSTRY IN INDIA

It appears from the presidential speech at the fourth annual Conference of the South India Soap Makers Association held in March that the production capacity of the soap industry varied between 16,000 tons in 1914 and 2,50,000 tons in 1949. The [illegible]

1,40,000 in 1944 and 2,00,000 tons in 1948 and it fell to 60,000 tons in 1950. The annual consumption of soap in India is estimated at about 1,25,000 tons. There would, therefore, be an exportable surplus after meeting the internal demands, if the productive capacity of the industry can be fully employed. There are 86 major factories and more than 5000 cottage industries which are manufacturing soap in India many of whom have already closed down and the rest are on the verge of closing down.

One chief difficulty met with is the exorbitant rise in the prices of essential raw materials such as vegetable oils, especially coconut oil, groundnut oil, etc. Another handicap has been the high import duty levied on coconut oil 42 per cent. standard and 30 per cent. preferential amounting to 40 per cent of the landed cost. Prices of all raw materials have gone up manyfold. To the misfortune of the industry the purchasing capacity of the masses has gone down at the same time due to various economic reasons. This leaves no room for increase in prices of soap. There was for a time a good demand for Indian made soaps. On the recommendation of the Soap Parel, soap manufacturers launched upon an expensive scheme sinking heavy capital. From 1947, there has been a steady decline in demand. The manufacturers hope Government will come to their rescue, and remove some of the more serious difficulties and ease the situation. If this is not done, the industry will be facing a gloomy future. One of the chief difficulties as previously stated, is the steep rise in the prices of coconut oil. The price in 1941 was approximately Rs. 200/- per ton; in 1950 it has risen to Rs. 2400/- per ton. Import duty on coconut oil in 1940 was approximately Rs. 50/- per ton; in 1950

port duty of Rs. 300/- in addition w brought the total duty to be pa: Rs. 800/- per ton. The soap ma pray that the import duty should be c pletely abolished or at least scaled d so that Indian soaps may be manufact economically and the surplus export the Middle East.

Caustic soda is another requirer which it is found difficult to procure. of a total requirement of 60,000 tons. production is 10,000 tons and balance has to be imported. Governr have given licences for import, but supply cannot be located in the U. or Continental countries due to stocl ing. It is hoped Government instruct their Embassies or Trade Cor ssioners to locate supplies and in importers and the Soap Industries so they may get, their requirements. suggested also that new caustic plants should be established to meet i nal demand. The industry is strug hard. With timely help from Gov ment it is hoped it will regain lost gr at no distant date.

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**RESEARCHES IN METALS**

During the last 10 years the M Committee of the Council of Scier and Industrial Rresearch has spons a number of important projects and result of its efforts production of n specialised steels and alloys has established. At the suggestion of Committee Tata Iron & Steel Co., took up production of "surgical steel suitable quality for manufacture of s cal instruments during the War and commercial demand for these sp steels is now being regularly Investigations on "electrical steel she were completed and these are now b

the country's requirements to a large extent. Heat resistant alloys of several types have been made and methods of their hot working and heat treatment have been worked out at the Mysore Iron and Steel Works, as a part of investigations on the 'manufacture for electrical resistance alloys.' Several length of wire were drawn with excellent results. All these are examples of how expenditure on research bears excellent dividends.

The schemes now being investigated under the guidance of the Committee included: (i) production of aluminium metal by electrolysis of aluminium chloride; (ii) production of nodular cast iron; (iii) effect of high purity manganese as an alloying element in steels and (iv) copper titanium systems. These researches are of considerable interest from the point of view of effectively utilising Indian materials and producing some of the materials by new methods.

Amongst the scheme which have now been transferred to the National Metallurgical Laboratory are: (i) extraction of beryllium from Indian beryl for which a new method has now been developed; (ii) manufacture of high purity manganese; (iii) manufacture of permanent magnets and (iv) and grain size control in steels [illegible] various metals. All these schemes aim [illegible] processing Indian ores and raw materials and convert them into valuable products for use in the country or export of the processed material abroad. Laboratory investigations on manufacture of aluminium titanium alloys have been completed and potentialities of commercial production are now being examined. Development of copper silicon bronze is awaiting field trials to practically test their suitability for use in machine bearings of various types.

In addition to these investigations a report on the utilisation and development of high duty cast iron steel in India w[illegible] compiled for the Railway Board and h[illegible] been published as a part of the Indi[illegible] Railway Conference Association Comm[illegible]ttee Reports. Extensive surveys [illegible] classifying and cataloguing of techni[illegible] data have been carried out with particul[illegible] reference to (i) fatigue in metals, ([illegible] wear of metals and (iii) surface hardeni[illegible] of metals. A survey of research data [illegible] (i) coinage alloys (ii) titanium, (i[illegible] zirconium has also been made.

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**INDIAN STANDARD FOR STRUCTURAL STEEL**

The use of steel in structures has [illegible] be based on rigid standards of perf[illegible]mance owing to the paramount need f[illegible] safety of human beings usually associat[illegible] with such structures. Structural st[illegible] worth about Rs. 20 crores is now bei[illegible] manufactured in India and the Indi[illegible] Standards Institution, 19. University R[illegible] Delhi-8, therefore, brought out an Indi[illegible] Standard Specification for Structu[illegible] Steel, IS: 226-1950. (Price Re. 1-8)

The Specification covers structu[illegible] steel generally used for bridges, buildin[illegible] and heavy engineering constructi[illegible] Owing to the present difficulties in obtai[illegible]ing proper raw material, it has been fou[illegible] difficult to limit phosphorus to 0.060 pe[illegible] cent which is usual. The maximum pho[illegible]phorus content in the specification ha[illegible] therefore, been raised to 0.065 p[illegible] cent with the proviso that when the st[illegible] is required for structures subject to dyn[illegible]mic loading, such as bridges, railway ro[illegible]ing stock parts, etc., phosphorus shall n[illegible] exceed 0.060 per cent.

Requirements of structural steel se[illegible]tions, such as plates, rounds, squar[illegible] flats and rivet bars, have been laid dow[illegible] specifications in respect of the process [illegible] manufacture, chemical composition wi[illegible] special reference to sulphur and phosph[illegible]

-ms content, freedom from defects and mechanical properties have been prescribed. An appendix to the standard gives the forms and dimension of tensile test pieces on which the values of the observed strengths greatly depend.

**U. P. MANGOES FOR BRITAIN**

The Agriculture Department of Uttar Pradesh is considering despatch of trial consignments of U.P. mangoes to London with a view to exploring commercial possibilities of Indian fruit in Britain. The despatches will be a continuation of experiments conducted last year which provided valuable data on the subject.

With the development of air transport, which has reduced the period of transit, it is now possible to pick the fruit in semi-ripe condition and export it to distant foreign markets without any deterioration in quality. As a result of the experience gained during the 1950 mango season, it is proposed that future consignments will be sent by rail from Lucknow to Delhi, where they will be uplifted by B. O. A. C. aircraft for onward carriage to London.

According to Mr. A. P. Gupta, Fruit Utilisation and Marketing Officer of Uttar Pradesh, who is mainly responsible for the experiments, Dashehri mangoes are better suited for export than the other varieties and the estimate of profit on this brand is as high as Rs. 75 per maund. In order to arrive at definite conclusions, however, Mr. Gupta considers that it is necessary to conduct further trials for two more seasons and see if mangoes can be profitably exported in any appreciable quantities on a commercial scale.

**ESTIMATES COMMITTEE'S REPORT**

Substantial savings are recommended in the Estimates Committee's report the Ministry of Works,Mines and Po[illegible] The Committee suggests that obs[illegible] publications stocked in the central pu[illegible]cation branch, should be weeded ou[illegible] sold to the public at concessional r[illegible] and steps should be taken to get the m[illegible] important publications reprinted. Gove[illegible]ment should explore the possibility [illegible] securing suitable advertisements for [illegible] popular journals on a commission ba[illegible]

The proposal for the setting up [illegible] new printing press at Nasik, the C[illegible]mittee recommends may be abando[illegible] and instead the press should be insta[illegible] at Aligarh, as this will lead to econ[illegible] in expenditure on transport and overh[illegible] charges. Nasik, says the Committee [illegible] not an ideal place for a printing p[illegible] doing Central Government work. M[illegible] of the paper mills which will feed the [illegible] press are situated in Northern India [illegible] huge expenditure will unnecessarily h[illegible] to be incurred on the transport of pa[illegible] alone. Considerable expenditure will [illegible] have to be incurred on freight charges [illegible] sending the printed materials from Na[illegible] to the offices concerned.

The Committee urges that priv[illegible] enterprise should be encouraged to m[illegible] up the works of developing and discov[illegible]ing the sources of wealth to supplem[illegible] the work of the Geological Survey [illegible] India. In granting mining licenses [illegible] private agencies, royalties should be fi[illegible] at adequate rates. A mining cess m[illegible] be levied on the lines of that imposed [illegible] sugar, tea, coffee, etc., and the proce[illegible] utilised in establishment of a special bra[illegible] of the Geological Survey for render[illegible] technical advice to private concerns.

## —NON-FERROUS ALLOYS

CATTERED throughout the pages of technical literature are various references to non-ferrous metals and their alloys, the importance of which is apt to be lost sight of because they become inaccessible after a short time. It is therefore desirable that such information should be carefully sifted and the useful matter collected and presented in a handy form. Such is the purpose of this article.

In engineering works nearly all non-ferrous materials in the form of alloys are used with the exceptions of copper and aluminium, which are used fairly extensively in the unalloyed state.

Non-ferrous alloys are very numerous. They are grouped thus:—

1. Brasses alloys of copper and zinc.
2. Bronzes alloys of copper and tin.
3. Special brasses and bronzes.
4. Copper-nickel alloys.
5. Bearing alloys.
6. Aluminium alloys.
7. Magnesium alloys.
8. Miscellaneous alloys.

**BRASSES**

These may be subdivided into

(1) Alpha — brasses, containing ... 37 per cent of tin

(2) Alpha-Beta—brasses, containing between 40 and 44 per cent of zinc.

The information contained in this ... is based on data contained in a publication of the Copper Development Association.

The alpha brasses are capable of being cold-worked to a remarkable extent, they may be rolled, pressed, and drawn. They can also be worked hot, but not nearly so readily as cold, while the presence of quite small amounts (0.1 per cent) of impurities such as lead will make them "hot-short". Two 'qualities" of brass are commonly used, *basis quality,* containing about 63 per cent copper and 37 per cent zinc, and *cartridge brass,* containing about 70 per cent copper and 30 per cent zinc. A variation of the latter is Admiralty brass, whose composition is 70 per cent copper, 29 per cent. zinc, and 1 per cent tin. In the annealed state cartridge brass has an ultimate strength of about 20 tons per sq. in., an elongation of about 70 per cent on 2 in, and a Brinell hardness of about 60. Cold-working hardens the alpha brasses and reduce their ductility; thus, hard-rolled sheet gives an ultimate strength of about 35 tons per sq. in., an elongation of about 12 per cent, and a Brinell hardness of between 150 and 200. Four "tempers" are commonly recognised as being imparted to brasses by various amounts of cold-working; they are: (1) Soft; (2) Quarter to half-hard; (3) Hard; (4) Extra or spring hard.

The annealing of brasses is a re-crystallisation process, during which new small crystals are formed. This re-crystallisation does not occur at temperatures below 280°C., and heating to within this limit is done merely as a stress-relieving operation. At temperatures over 400°C., grain growth may occur if the heating is unduly prolonged. Annealing is usually done at temperatures between 300°C and 600°C., and the material may be quenched in water, or cooled in air, afterwards, the rate of cooling being unimportant.

Articles made of alpha brasses that have been cold-worked often exhibit what is called season-cracking—the formation of cracks some time after manufacture and without the application of any external load. This is due to the internal stresses left in the material by the cold-working,

and is accelerated by corrosive atmospheric conditions. It can be obviated by stress-relieving the articles by heating them to between 250°C and 275°C. for half an hour to one hour. As mentioned above, this treatment has no effect on the mechanical properties of the brasses.

#### THE ALPHA-BETA BRASSES

When the zinc content exceeds 39 per cent, a second constituent (the Beta form) appears in the microstructure of brass. This constituent makes the brass readily workable while hot. When the zinc content exceeds 49 per cent a third constituent (the game-form) appears: but brasses containing this constituent are rarely used. The alpha-Beta brasses containing this between 39 and 44 per cent of zinc are, however, widely used for hot-pressings, stampings, etc. One of th best known and earliest examples is that known as Muntz metal, whose composition is approximately 60 per cent copper and 40 per cent zinc. It is somewhat difficult to machine, but this can be remedied to a large extent by the addition of up to 3 per cent of lead. The lead, however, makes the metal hot short at about 550°C. and at temperatures above 750°C., so that it can be forged only between 650°C and 750°C. Lead is not soluble in copper or zinc, and remains merely distributed throughout the mass; trouble is consequently sometimes experienced from undue segregation.

#### BRONZES

These are alloys of copper and tin; although up to 16 per cent of tin may be retained in solution in copper if the alloy is cooled very slowly, the amount that can be retained with practical rates of cooling is about 8 per cent. Bronzes containing up to 8 per cent of tin correspond, therefore, roughly to the alpha brasses; then can be cold-worked, but not so easily as the brasses. Tin contents greater th per cent are used for castings and amounts of phosphorus are some added to help in the elimination o oxide and to improve the mechanical perties. Excess of phosphorus lead brittleness and normally the content is about 0.05 per cent; in true pho bronze the phosphorus content is fro to 0.5 per cent. In the form of ca phosphor bronze will give an ult strength of about 18 tons per sq. in an elongation of about 4 per cent wrought bronzes will give ultimate st ths of 22-24 tons per sq. in. with elo tions of about 60 per cent in the an state, while in the worked conditio ultimate strength may be as high as 5 tons per sq. in.

#### GUN METAL

This is an alloy of copper, tin zinc and is widely used for cast particularly when they are of comple form. A common composition is co 88, tin 10, and zinc 2 per cent, and will give an ultimate strength of abo tons per sq. in. together with an elo tion of about 20 per cent.

#### SPECIAL BRASSES AND BRONZES

Additions of manganese, nickel, aluminium, and some other elements prove the properties of brass and b and are widely used. In brasses the sulting materials are generally know high tensile brasses, but the name h is often misapplied. An example of a tensile brass is delta metal, which is alpha brass containing about 2 per of iron and 1 per cent of manganese; alloy may be cast, may be worked (above 500°C.), is resistant to corro and has mechanical properties that m it a useful substitute for mild steel.

In recent years much progress has l made in the development of brasses

an be heat treated so as to be made soft or working and then hardened and improved in mechanical properties. ...h alloy has the composition, copper 72 ...er cent, nickel 6 per cent, aluminium $1\frac{1}{2}$ ...er cent, and zinc $20\frac{1}{2}$ per cent; it way be ...ealed by quenching in water from ...0° C. and hardened by re-heating to ...out 500° C. and cooling slowly.

ALUMINIUM BRONZES

This name has been given to alloys of copper with up to 12 per cent of aluminium and sometimes, nickel, manganese, and ... The copper-aluminium alloys con...ning less than about 7 per cent of alu... possess great ductility; for example ...n alloy containing 4 per cent of alumi... will give an elongation of 80 per ...n 2 in.: these alloys may consequent... be readily worked cold. Alloys ...taining from 8 to 12 per cent of ...minium are used for castings and will ...e a tensile strength of about 30 tons ...sq. in. and an elongation of 20-40 per ...n 2 in. in the sand-cast state. When ...t the tensile strength is some 30 ...cent higher. The alloys are suscep... to a heat treatment consisting of ...ching and tempering.

...ese alloys have excellent corrosion-...ng properties, being practically ...n this respect to an 80-20 cupro-... their corrosion-fatigue properties ...so very good. They are suitable ...avity die-casting but require special ...nt when cast in sand moulds, partly ... they have a very narrow freezing ... and partly because they absorb ... and oxides rather readily when ...

NICKEL BRONZES

These are of two types: (a) low ...kel and (b) high nickel. The former contain 3-5 per cent of nickel, 5-10 per cent of tin, and 0-2 per cent of zinc, and in the form of sand-mould castings will give an ultimate strength of 18-24 tons per sq. in. with an elongation of 20-10 per cent. The high nickel bronzes contain 15-60 per cent nickel, 6-12 per cent tin, 1-2 per cent zinc, up to 3 per cent silicon, and 0.1 per cent magnesium. They will give, in the sand-cast state, ultimate strengths up to 30 tons per sq. in.

COPPER LEADS OR LEAD BRONZES

These names have been given to a series of alloys of copper and lead with or without tin. They may be divided into three groups: (a) those containing 5-10 per cent of tin and 8-10 per cent of lead, which are used for castings for heavily loaded sliding members, slide-valves, bearings, etc.; (b) those containing up to 35 per cent of lead and only about 5 per cent of tin: these are sometimes called plastic bronzes, they have little strength and are used chiefly as linings to bearings, shells being used to support them. The third group comprises the alloys in which very little or no tin is used.

COPPER-NICKEL ALLOYS.

Nickel and copper alloy together in all proportions so that the range of copper nickel alloys is extremely wide. The addition of nickel to copper improves the mechnical properties and increases the resistance to corrosion. Up to 2 per cent of nickel is consequently now commonly added to copper for such things as locomotive firebox stay rods; in special circumstances up to 12 per cent has been used. When the nickel content is between 15 and 30 per cent the alloy has remarkable drawing properties, and is used for the sheaths or envelopes of rifle bullets; these alloys are called cupro-nickels. A 70-73 cupro-nickel is widely used for condenser tubes as it has been found to have outstanding resistance to corrosion and erosion. These tubes are

***produced by an extrusion process followed by cold reduction in dies.***

### MONEL METAL

This is one of the most widely used and remarkable of the nickel-copper alloys. It contains about 70 per cent manganese, and traces of other elements, the balance being copper. It possesses very high corrosion resistance coupled with excellent mechanical properties, the latter, which are better than can be obtained with most other non-ferrous alloys, being well maintained at high temperatures. Monel metal can be cast and can also be worked both hot and cold; its mechanical properties are given in the table below. Recent researches have shown that, as with the nickel bronzes, additions of certain elements will make monel metal amenable to heat treatment. The elements used are aluminium, silicon, and beryllium and the hardening is a "precipitation" process, which occurs briefly as follows. The elements combine with nickel to form compounds that are normally insoluble in the monel metal case at ordinary temperatures but which can be retained in solution by rapid cooling. When the compounds are in solution the alloy is soft and readily workable, but when they are precipitated out, by heating to between 400°C and 500°C. and cooling comparatively slowly, the alloy is hardened and its mechanical properties are improved. Cold working also increases the strength and hardness but, of course, reduces the ductility.

The addition of aluminium, silicon, and beryllium to copper-nickel alloys containing up to about 30 per cent of nickel produces alloys that are heat-treatable and which have high corrosion resistance, though not to the same extent as monel metal. For example, an alloy containing 30 per cent nickel, 1½ per cent aluminium, and the balance copper, gives *an ultimate strength of 27* tons per *in. in the annealed* (water quenche *state, and this value is raised* to abo *48 tons per sq. in. by reheating;* if co work is done on the alloy before reh[illegible] the strength may be raised as high [illegible] tons per sq. in.

### NICKEL BRASS OR NICKEL "SILVER"

These names, and also the name Ge[illegible] man silver, are applied to alloys of copper, zinc, and nickel; the copper-zinc ratio generally about 70-30 while the nickel content ranges from 5 to 30 per cent. T[illegible] alloys have a silvery appearance [illegible] possess very good resistance to atmospheric oxidation and corrosion, hence they find a wide use in both engine[illegible] and commercial applications. The [illegible] below gives some typical composition

| | | | | | |
|---|---|---|---|---|---|
| Copper . . . | 65 | 65 | 64 | 62 | 5[illegible] |
| Zinc . . . . | 25 | 20 | 18 | 33 | 2[illegible] |
| Nickel . . . | 10 | 15 | 18 | 5 | 1[illegible] |

Recently it has been found that [illegible] with monel metal and the high tens[illegible] brasses, the addition of aluminium m[illegible] these alloys heat-treatable.

### BEARING ALLOYS

It has been found that the most [illegible] able material for use in many bearing[illegible] one in which grains or blocks of a [illegible] constituent are embedded in a matri[illegible] comparatively soft material. This is be[illegible] cause the soft matrix permits the be[illegible] to deform sufficiently to conform to [illegible] journal or shaft, while the hard bl[illegible] keep the wear low. The soft matrix al[illegible] absorbs any particles of foreign ma[illegible] that may get into the bearing and [illegible] prevents scoring of the journal. Most [illegible] the bearing alloys now in use have thi[illegible] type of structure.

The structure is obtained in phosphor bronze, but the matrix material is too har[illegible] for these alloys to be satisfactory in heavi[illegible] ly loaded, high-speed bearings, such a

nd and main bearings of high speed nal combustion engines. For lighter s, however, phosphor-bronze is much he tin content may range from 5 to er cent but usually is between 10 and er cent, phosphorus is between 0.05 0 per cent, and up to 20 per cent of may be included. Phosphor-bronze es are sometimes made moulding a ure of copper and tin, in powder in presses under heavy pressures to 40,000 lb. per sq. in.), heating up bout 700°C., and cooling in air or ching in oil. These bushes, being tly porous, can retain oil in the pores, making them self-lubricating over periods, Graphite may also be ded in the mixture of powders.

For heavy duty bearings white-metal s or copper-lead alloys are now ally used. The oldest white metal abbitt's metal, which contains about er cent of tin, 5 per cent of copper, 10 per cent of antimony. The anti- . in the form of a solid solution in of the tin, provides the hard blocks ains; these blocks, being lighter than matrix metal, tend to float to urface, but this is largely prevented e formation of a compound of copper tin which, being present in the form mass of needle-like crystals, entangl- e antimony-tin blocks and thus pre- undue segregation. Because tin is expensive attempts have been made velop white metals containing smaller ntages than are used in Babbitt l, and metals containing 75-84 per of lead, 5-15 per cent of antimony, only 5-12 per cent of tin are now in The percentage of antimony is ge- ly between 10 and 12 and this ele- again provides the hard blocks in structure. Broadly speaking the er the lead content the less severe duty the bearings can withstand.

In recent years "alloys" of lead and copper (misnamed lead 'bronzes") have been developed and have largely displaced white metals in high duty bearings. These alloys contain from 25 to 45 per cent of lead, from 60 to 75 per cent of copper, and small amounts of other elements: for example, up to 1 per cent of tin or 1-1½ per cent of nickel and up to 0.5 per cent iron.

Lead and copper do not dissolve in each other at all and lead bronzes are merely mixtures of the two metals. Segregation is, therefore, a difficulty that is commonly met in the production of copper-leads, but with suitable casting or melting techniques it can be avoided.

### ALUMINIUM ALLOYS

Pure aluminium is too soft, and its tensile strength is too low, for it to find much use in engineering applications but it is extensively used in a 99.9 per cent pure state for such things as motor-coach body panels, trimming, and fittings, and for architectural and domestic purposes. Additions of certain elements, however, improve the mechanical properties so much that, weight for weight, aluminium alloys are equal in strength to the best alloy steels and are consequently very widely used. The principal alloys may be grouped as follows.

1. Aluminium-copper alloys.
2. Aluminium-zinc-copper alloys.
3. Aluminium-silicon alloys, sometimes with copper in addition.
4. Alloys 1, 2, or 3 with additions of magnesium, manganese, nickel, iron, or tin.
5. Complex alloys, duralumin, Y-alloy, the R. R. alloys, etc.

### THE ALUMINIUM-COPPER ALLOYS

The addition of copper hardens and strengthens aluminium, the tensile strength increasing steadily with the cop-

per content up to about 8 per cent of copper, beyond which point little improvement occurs. Up to 12 per cent is, however, used because the machining properties of the alloy are improved by the higher copper content. Two alloys in this group are widely used for castings; one contains about 12 per cent of copper and the other from 6 to 8 per cent. The properties of the latter can be improved by a heat treatment consisting of heating to about 540°C. and quenching in water but the improvement does not occur until some days after the treatment. This delayed action is known as ageing and is characteristic of many aluminium alloys.

### ALUMINIUM-ZINC-COPPER ALLOYS

The addition of zinc also hardens aluminium, but when the percentage exceeds about 13 the alloy suffers from hot shortness and is thus unsuitable for casting. This hot shortness can be eliminated by the introduction of 2½—3 per cent of copper and an alloy containing 13-14 per cent zinc and 2½-3 per cent copper is widely used. It has an ultimate strength of between 11 and 16 tons per sq. in.

### ALUMINIUM- SILICON ALLOYS

In these alloys the silicon content ranges from 5-15 per cent and the alloys possess work-hardening properties. Thus aluminium-silicon sheets are supplied in three "tempers", hard, medium, and soft, according to the amount of work done on them during the rolling process.

When the silicon content is between 8 and 15 per cent the properties of castings may be improved by putting a small quantity of an alkaline metal, an alkaline-earth metal, or one of their compounds, into the molten metal immediately before pouring. Sodium is commonly used and the result is a great refinement in the structure of the material, the addition apparently checking the growth of the first crystals formed and keeping them smal in size. The process is known as modification. Thus a 13 per cent silicon alloy cast in the ordinary way might show an ultimate strength of only 6-8 tons per sq in. and an elongation of only 0.5-1.2 per cent. If modification is done then this alloy might show an ultimate strength of 12-16 tons per sq. in. and an elongation of 7-15 per cent. The modified alloys are very malleable in the as-cast condition; they also shrink less than most other alloys during solidification and this helps in the production of sound castings.

### DURALUMIN

This is one of the oldest and best known aluminium alloys and is widely used in the form of forgings, pressings and rolled sections but is not suitable for castings. Its composition is copper 3.5-4.5, manganese 0.4-0.7, silicon about 0 per cent and, sometimes, magnesium 0.4-0.7 per cent. Iron is usually present but must be kept below 0.5 per cent. Duralumin can be worked readily at temperatures of about 500°C. and after quenching ages over a period of 4-5 days.

### Y-ALLOYS

This has the composition copper 4, magnesium 1.5, and nickel 2 per cent. It may be forged but is most widely used for castings. To develop its best properties it must be quenched in boiling water from a temperature of about 515°C. It can then be aged at room temperature for about 5 days or in boiling water for about 2 hours. Its ultimate strength is about 1[illegible] tons per sq. in. in the cast and heat-treated form but chill castings, after heat treatment, may show a strength of 20 tons per sq. in. The alloy maintains its strength well at high temperatures and is widely used for the pistons of internal combustion engines.

## MAGNESIUM ALLOYS

The only magnesium alloys of any ...tance are those known by the trade ... Elektron. Of these there are se- ...l compositions, each used for certain ...ular purposes and each possessing ...al properties. One alloy, used for ...ngs, has the composition aluminium ..., zinc less than 3.5, manganese less ... 0.5, impurities less than 1.5 per cent, ...lance being magnesium. This alloy ...n ultimate strength of about 8 tons ...q. in. For rolling into bars an alloy ...d which has the composition alumi- ... 11 per cent, zinc less than 1.5 per ..., manganese less than 1.0 per cent, ...rities less than 1.5 per cent. This ... will show an ultimate strength ...ing from as high as 17 tons per sq. in. ... smaller sections down to about 14 per sq. in. in the larger sections. For ...ding into bars an alloy containing more than 0.2 per cent aluminium and more than 2.5, 0.2, 0.2, 0.4, and 0.5 ...ent respectively, of manganese, zinc, ... silicon, and impurities is used. ...ill give a proof stress of 8 tons per ... and an ultimate strength of about ...ns per sq. in. with an elongation of ... 2 per cent. For general forgings ...omposition aluminium 7.5-8.5, zinc ...55, manganese 0.15-0.25 is used and ...ive a proof stress of 11-14 tons per ... and an ultimate strength of 18-22 per sq. in. a reduction of area of ... 10 per cent and a Brinell hardness ...en 65 and 75.

...ektron can be worked cold only to ... limited extent but at a temperature ...n 270° and 330°C. it may be work- ...dily. It is the lightest alloy known ... ent and is used extensively in aero- ... construction. It is poor in resistance ...rrosion and must be protected by some ...ace treatment such as by painting.

The principal die-casting alloys are those having zinc, aluminium, lead, or tin as the base metal; the first two are much more widely used than the last two. Lesser used base metals are copper and magnesium.

Two commonly used zinc base compositions are: (a) copper 2.5-3.5, aluminium 3.5-4.5, magnesium 0.02-0.10 per cent; and (b) copper 0.1 max., aluminium 3.5-4.5, magnesium 0.03-0.08 per cent, zinc forming the balance in each alloy.

## SOLDERS

These are divisible into two groups: (a) soft solders, and (b) hard solders. The principal soft solders are lead-tin alloys; thus tinsmith's solder ranges from about 40 per cent to about 70 per cent tin. A composition—tin 63 per cent, lead 37 per cent—gives the eutectic alloy, which melts at 183°C. British Standard Grade B solder has the composition, tin 50 per cent, antimony 2.5-3 per cent, lead 47.5-47 per cent. This is the type of solder used for most manufacturing work. Plumber's solder has the composition, lead 70 per cent, tin 30 per cent; it freezes over a wide range of temperature and, being pasty between the beginning and end of solidification, is suitable for making "wiped" joints. Tinsmith's solder is always used with a flux, whose function is to render fluid the oxides produced and to form a film over the surfaces being joined so that the oxides can be kept away. The chief fluxes are "killed spirits" or zinc chloride, ammonium chloride, resin, and tallow. Cored solder, in which the flux forms the core or cores, is obtainable and is being more and more used.

When hard solders are used the process is sometimes called brazing and the solder is then called spelter; a common composition for spelter is copper 50 per cent, zinc 50 per cent, but up to 1.0 per

cent of silver is sometimes included. Another hard solder is that known as silver solder; this consists of 10 per cent nickel, 40-50 per cent zinc, the balance copper. The flux commonly used for brazing and silver soldering is powdered borax.

### LOW MELTING POINT ALLOYS

Alloys which melt at low temperatures, ranging from 60° up to 200°C., are of great use for certain purposes and numerous alloys have been developed. One of the oldest and most used is Wood's metal which melts at 60.5°C. It consists of bismuth 50, lead 25, tin 12½, cadmium 12½ per cent. Another is Rose's metal which is the same as wood's, except that the cadmium is replaced by tin; it melts at 93.7°C. Cerromatrix, an alloy developed by the Cerro de Pasco Copper Corporation, has the composition, bismuth 48 per cent, lead 28.5 per cent, tin 14.5 per cent, and antimony 9.0 per cent. It melts over the range of temperature 102.5°-227°7C. and expands on solidification. Among other uses it is used for setting press-tool punches into their holders.

## —PLASTIC AS PROTECTIVE COATINGS.

)AMP atmospheric conditions affect the efficiency of all electrical and ..o apparatus very seriously, and ade- .. steps have to be taken to prevent ..are condensing on, or being absorb- .., the insulating material employed. .. is particularly important with re- .. close wound coils such as are used ..ansformers and chokes.

The wire used for low frequency coils .. chokes is usually enamelled, and for .. frequency components the wire is .. .d with silk, cotton, or both. Enamel .. ..ture resistant, but it is not always ..ble to use it alone because it can ..fected by chemical fumes and solvents. .. is also liable to be cracked or crazed ..he stresses set up in the coil winding ..ations. Silk and cotton, although .. insulators when perfectly dry, are ..ly absorbent. Also, moisture con- ..ing between the layers of wire, and ..cent turns of the winding, can be quite .. trapped and eventually absorbed by ..insulating medium. Often this is the ..e of corrosion on the iron stampings .. for the core.

To obviate the dangers which arise .. moisture is allowed to condensate ..mical fumes are allowed to penetra- ..to such windings, it has become ..sary to completely impregnate the ..d coil with a suitable insulating and ..re resistant varnish or compound.

To meet modern requirements such ..ounds, apart from being good insu- .. capable of withstanding the poten- ..fferences existing between separate .. of the winding, must also be stable .. a wide temperature range. They ..ld not soften at temperatures up to C., and should not become brittle or ak up at temperatures as low as 40°C. Nevertheless, in order that impregnating can be carried out efficiently, and to ensure that the compound reaches all the small spaces right inside the coil, it must flow freely at a temperature below that which is likely to damage the wire covering. It is desirable that it has a very marked flow point, so that a minimum temperature change will transform it from the solid state into a free running liquid. When it re-sets the compound should be impervious to moisture penetration, and unaffected by temperature changes within the range stated.

When low frequency coils are being dealt with, the only electrical requirements are high dielectric strength and good insulation resistance, but in high frequency circuits compounds with a low-loss factor must be used, as otherwise the impregnating medium will constitute a leakage path for high frequency currents.

### TYPES OF COMPOUNDS AVAILABLE

Research to produce the ideal compound has gone on for many years, and at present numerous types are available. These may be broadly classified under three headings:—

Waxes, air-drying varnishes containing natural drying oils and resins, and varnishes with a synthetic-resin base, in a solvent, which is dried off by evaporation and heat polymerization.

All three types are widely used, but the following points should be noted.

Waxes at present available are not very satisfactory over a wide temperature range, and do not offer the same degree of mechanical protection as the varnishes.

Air drying varnishes contain solvents which dry off upon exposure to air. If it were possible to ensure that these solvents

*are completely dried off, such varnishes would offer excellent protection, but great care must be taken to ensure that quantities of the solvent are not trapped inside the coil. It is quite easy for this to happen because after the coils have been dipped* the varnish on the outside will dry first and the drying process will continue inwards. There is, therefore, no way of escape for the solvent from the varnish which has penetrated right inside the coal. It is recognised that it may be impossible to guarantee that no solvent has been trapped in this manner, and the modern tendency is for varnishes to be mixed with solvents which have no deleterious effect on the enamel or cotton covering of the wire.

The synthetic-resin varnishes, which are used far more extensively than any other type, also suffer from the disadvantage of possessing solvents which must be dried off completely, but they are not dependent on air oxidization as a hardening and drying process. A coil dipped in a synthetic-resin of the thermo-setting type is subjected to a heating cycle similar to that applied to a compound for moulding purposes, and the chemical action which takes place is also similar. It has been proved to be much easier to ensure that a synthetic-resin varnished coil is dried off, right through to the core, than one dipped in an air-drying varnish of the ordinary type. In all cases, however, the depth of winding is the governing factor.

The adoption of high frequency heating has also helped in this respect. When this method of heating is applied, heat is generated uniformly throughout the coil, consequently the inner layers of varnish dry off and the solvent is released before the outer layers have hardened.

To the same extent, as it is essential to avoid trapping solvents from the impregnating compounds, so it is equally as *important to be sure that no moisture trapped inside the coil after the impregnating process is completed. It has, therefore, become standard practice to pre-heat the coils and carry out the dipping process in a vacuum. A typical cycle of operations for impregnating a coil in* synthetic-resin varnish is described below.

**IMPREGNATING PROCESS**

The coils are first dried thoroughly in an oven or current of hot air at a minimum of 110°C. for anything from two to twenty hours, according to size. They are then transferred to the impregnation plant, and a vacuum is maintained in the tank for not less than 45 minutes. Cold varnish is admitted until the coils are covered.

The next step is to re-admit air and compress it to between 60 and 80 lbs. per sq. inch, under which conditions the coils are left for a period, the duration depending on the size of the coil. This may vary between thirty minutes and one hour. The varnish is then drawn off and the coils are left drain. They are then transferred to a hot vacuum tank wherein a temperature of between 70°C and 80°C is maintained for a few hours, and a circulating atmosphere is maintained through a solvent condenser. This is to drive off the solvents. After this, the temperature is raised to "cure" the resin.

Tests for insulation resistance are then made. The figure usually required is 100 megohms between coils, but a minimum figure of 25 megohms is permissible in many applicaions. If the core is fitted before impregnating, the same insulation resistance is required between the coils and the core.

**DIP COATING**

It has been proved that one application of the impregnant is not enough to enable the insulation resistance figure to be main-

ned up to the standard in first grade rk, such as is suitable for tropical use, therefore, a second application is led for. This is carried out in much the ne manner.

This second coat does not provide as ed protection as a dip coat of a more d compound. Most manufacturers adopted the dip coat as standard ce.

A good dip coating material should stable over a range of temperature plus 70°C. to 40°C. and must also resistant to moisture and man-handling. addition its heat dissemination proper- must be such that it does not shut in heat which may be generated in the nsformer or choke. This is important, cause the dip coat is usually thick and ers the coil completely.

There are various dip-coating com- unds available, most of them of the minous type, and the process is a sim- one of dipping the pre-heated coil in molten compound or solution, care ing taken to prevent any air being pped during the dipping process.

It is most important that a dip coat ould adhere to the surfaces which it has eloped, and that no expansion or inkage which would cause it to break ay from these surfaces should take with changes of temperature or a period of ageing. If such break- s do occur, a moisture trap between outer surface of the coil and the inner e of the compound is created. It is lly as important to ensure that no holes exist in the coating, and that out wires from the coil bobbin are ed securely so that vibration does cause these wires to oscilate in the men, thereby setting up a cracked ce on the latter material. Yet an- her important point to note is that the eving used to insulate the lead-out wires should be a very good fit on the wire, and should be sealed to prevent moisture entering between the wire and the inner wall of the sleeving. On no account should a varnished fabric sleeving be used for covering these wires. Fabric sleeving absorbs moisture and acts as a wick, drawing the moisture into the transformer or choke winding.

A transformer or choke treated as above should pass a "tropical test" of the following order.

Exposure to a temperature of 71°C. for 6 hours, followed by a cooling period of 16 hours. Then exposure to a temperature of not less than 60°C. with relative humidity at not less than 95% for 6 hours. The transformer or choke should not be heated prior to this part of the test. In other words, it should be taken straight off the bench and placed in the test chamber which has previously been adjusted to run at these conditions.

For the next part of the test cycle the component should be left in the chamber, and the heat and humidity controls of the latter should be switched off. No air circulation should be permitted. This condition is to be maintained for 16 hours. It is to be expected that heavy condensation will occur during this period, which is intended to simulate the right conditions in a tropical climate. After this 16-hour period the component should be removed from the chamber, the surplus moisture should be wiped off, and a skeleton electrical test should be carried out immediately. Then repeat the above procedure from the stage where the component is exposed to 60°C. and 95% humidity.

The above cycle of tests is designed to accelerate the actual conditions likely to be encountered in service, but other factors play a part in attacking the re-

liability of the component when exposure to actual conditions takes place over a long period. Consequently more stringent test conditions are being laid down which involve exposure to a temperature and humidity cycle of 25°-40°C. at 95% relative humidity for two months or more. This continual exposure to water vapour and condensation very soon breaks down all but the very best of components.

Another recent development is the totally enclosed hermetically sealed type of transformer, for which a metal can, fitted with ceramic bushes as terminal connections, is used. In this type of construction a plastic compound is used as a filling. This compound is injected into the can under pressure, after the transformer or choke assembly has been thoroughly dried and impregnated with varnish.

Components treated in this way will probably give years of reliable service, but naturally the expense is greater than that incurred with other methods of protection, and it has yet to be definitely proved that any criticism of the varnished impregnated and dipped type, which may arise from time, is not really a criticism of the processing carried out on the particular range of components under test, rather than criticism of the basic method and the materials used.

**COILS FOR HIGH-FREQUENCY CIRCUITS**

Special waxes have been developed for treating coils designed to carry high frequency currents. In addition to possessing all the normally desirable properties, they must also possess a very low loss factor, and a dielectric constant of not more than 4.5 at frequencies up to 20 megacycles.

Surface resistivity should be at least $10^6$ meghoms per $cm^2$. Volume resistivity $10^7$ meghoms per $cm^3$.

The wax should not melt at tempe tures below 75°C., and no cracking sho occur when the wax is exposed to 40 (

The wax should be resistant to mc ture penetration, and should have injurious effect on the enamel or fat covering of the wire.

A number of such waxes exist and widely used as protective coatings.

The composition of these w varies considerably. Mixtures of pa ffin wax, which is obtained from petrole by distilling processes, chlorinated rubb and chlorinated naphthalenes, are n used. Chlorinated naphthalene comb well with many other synthetic a natural waxes, and is used with rub for improved fire-resistant products, a with other mineral waxes to raise softening temperature.

An important point to note in con tion with the uses of waxes in equipm which may be exposed to tropical con tions is that mineral waxes are superior to any of the natural wax because of their fungicidal properties

Waxes embodying a chlorinat naphthalene content are far less likely support the growth of fungus than natu vegetable waxes. Chlorinated naph lenes have remarkable anti-fungus pr perties and good electrical properties

The method of treatment used so f has been simple dipping process, but w the development of injection mouldi technique, and the introduction of n materials, which are combinations waxes and new synthetic resins, l melamine, it is highly probable that future all protective coatings will be a plied by moulding around the article to protected a hard, moisture and heat r sistant plastic. The more recently dev loped waxes are hard, and can be appli by adopting an injection mouldi technique.

The use of varnishes with low loss opcrties, such as polystyrene varnishes, also on the increase, although one of the fficulties encountered with such products that they are difficult to apply satisfac-rily on a production basis, and contain lvents which are injurious to many of , wire-coating mediums which are tensively employed.

ONDENSERS AND OTHER COMPONENTS

Where it is intended that they be ed in circumstances involving exposure extremes of temperature and humidity, ndensers and other radio components also dipped or moulded in waxes and ling compounds. This sealing is very portant having regard to the small ca-cities involved, and the effect on such acities of moisture penetration.

For small condensers, for use in high quency circuits, the practice of mould-g the condenser plates and dielectric in ythene is being extensively adopted. is can be done on small injection ulding machines, the only objection be-g the softening and deformation tem-ature of this plastic. Flat section, block type condensers have been moulded in Bakelite housings for some time, and the tendency is to totally enclose all conden-sers in a moulded casting. Moisture penetration through the holes provided for the connecting wires or tags often occurs if the seal between the moulding material and the wire is not perfect. To overcome this, special waxes or varnishes are applied to provide an additional protective film.

GENERAL PROTECTIVE COATINGS AND VARNISHES

Synthetic resins are, of course, used in the compounding of protective enamels for metal work used in radio and electrical equipment, and for finishing wooden radio cabinets, etc. They are also used as tem-porary protective coatings for transit pur-poses only. Ethyl cellulose is already being used in this way, as a thin film, which is applied by dipping or spraying. When this film sets hard it acts a protec-tion against moisture and fungus. The coating can be stripped off when trans-portation is complete and the component is required for use.

## —MANUFACTURE OF NOEVLTY LEATHERS

THE range for novelties in fancy leather goods has caused the up-to-date light eather manufacturer to be continuously on the alert to produce novelties in eather manufacturer to be continuously on the alert to produce novelties in leather. These, when made into the many fancy articles made from leather, such as purses, handbags, photograph frames, jewel cases, etc., are intended to catch the public eye.

The following methods will indicate to some extent a few of the processes which may be regarded as typical of the ingenuity which has been exercised in the production of these novelty leathers.

### ANTIQUE LEATHERS

This is a leather which is much in fashion for upholstery and fancy purposes. Antique or Spanish leather is mited on split hides, calf, kips, and also sheepskins.

A common method of producing an antique effect is to take advantage of the use of a waterproofing agent applied to the more prominent portion of the embossed grain of the leather; these agents are commonly called resists. One very common method consists in dyeing, staining, or spraying the leather a brown or other suitable colour, and afterwards embossing with a natural wrinkled cowhide print. To the upper portion of the grain of the printed leather is carefully applied a wax or grease resist: the application being made by hand. The leather is then sprayed or brushed with a soft-haired brush, with a suitable black dyestuff or a solution of iron. The effect is to dye the crevices or the lower portions of the printed grain a brownish black, and have the higher portions where the resist has been applied; the leather produced thus resembles a piece of cold leather with a worn appearance on the more prominent part of the grain surface. The wax resist is subsequently removed by wiping the dry leather over with a suitable oil solvent, e.g. petrol, trichlorethylene, etc.

A simple method of applying the fatty resist is to make a mixture of equal parts of paraffin wax and hard beef-tallow, melting them together and allowing the mixture to set in a suitable shaped vessel, so as to produce a solid block of grease, somewhat similar in size and shape to a pound bar of soap. Application is made to the leather by simply rubbing the solid bar of grease over the grain surface.

The fatty resist may be substituted by either a solution of shellac dissolved in spirit, or a cellulose solution such as is used in finishing. When the solvent evaporates, both these solutions leave behind a transparent film, and it is not necessary, therefore, to remove the resist from the leather after spraying with the black dyestuff solution, and no further treatment of the leather is essential.

A variety of effects are produced upon skins by heavily embossing the goods after dyeing them to some particular shade, and drying them out as if for finishing in the ordinary manner, and then, after softening the skins by boarding them on the table, lightly snuffing off the grain surface of the skins, either by the buffing machine or by hand with a carborundum or emery covered block so as to remove the high portions of the embossing. The skins may be left either as buffed and finished in the usual way, or they may be topped by brushing or spraying with a solution of dyestuff of another colour, so as to stain those portions of the grain surface that have been considerably lightened in colour or render-

d white by the buffing. The outcome is
o produce a foundation colour on the skin
ith a different colour effect on the por-
ons that have been removed by the
uffing. Very tasteful effects are thus
roduced on calf. East India kips,
houlders or sides.

**MARBLED LEATHER**

Quite a large variety of leather with
n artistic marbled or mottled appearance
produced. Perhaps the oldest method
producing marbled effects is a form of
inting with a sponge that has been dipp-
d in a suitable dyestuff solution; the
ponge being dabbed over the prepared
urface of the leather, leaving an impres-
on of that portion of the sponge surface
hich has come into contact with the
ather. It is usual, to dab the leather
er with different sponges dipped in
rious coloured solutions, so as to bring
out a mottled coloured effect.

Sometimes the process is varied by
scharging the colour from a dyed
ather by sponge-dabbing with an agent
pable of effecting a discharge. As an
ample of this, if a leather, stained a dark
own colour by the employment of a
estuff in conjunction with a weak iron
lution, is then spongedabbed with a so-
tion of dilute oxalic acid, this will
scharge the iron and leave a marbled
ct on a lighter colour ground where the
onge has been applied.

It is possible by this somewhat crude
d ancient method to produce quite a
ty of artistic effects which render the
her particularly suitable for making
a number of fancy leather articles.

**BATIK MARBLING**

This is a pretty marbled effect intro-
d originally from Austria. This
rbled leather production, which was
ionable a couple of decades ago, like
er products of a novelty character, has
been allowed to go into disuse, but has
recently been re-introduced in both the
old form and also with improved results.

After the usual processes of prepara-
tion and striking-out, the method of treat-
ing the leather consists in pleating or
puckering it up into folds by hand, and
the skin is then dyed in the pleated or
puckered condition. Several methods are
in use for carrying out the dyeing process.

(1) The skin, after being uniformly
pleated, is placed in a small wooden trough
or box fitted with a perforated bottom,
just sufficiently large to take the skin
comfortably in the folded-up condition.
The dyeing is done by pouring the dye-
stuff from a jug or some other con-
venient vessel over the skin whilst it lies
in the trough. The dyeing must, of neces-
sity, be done very rapidly, and in conse-
quence it is advisable to use a basic
colour. After a lapse of a few seconds
the skin is removed from the box and
immediately washed out. On account of
the folds into which the skin has been
pleated, the dye solution is taken up un-
evenly; the various tints, however, blend
into each other, and the result is a some-
what pleasing effect.

(2) A more recently introduced style
of batik marbling, in which an attempt is
made to produce a more regular pattern
and at the same time a result which re-
sembles a flower design or print, is known
as Dahlia or Marguerite marbling. This
effect is produced by pleating the leather
—usually skiver, thin Persian sheep, or
East India goatskin—by pushing the skin
at regular intervals through a perforated
plate possessing either square, round, or
hexagonal holes of varying diameter
(according to whether a small or large
flower is to be imitated), and then spray-
ing the leather with a suitable dyestuff
mixture, whilst it is held in position by
the perforated plate or wooden board,
through which it has been pushed. The

small pleat occasioned by pushing the leather through the orifice bring about a simulation of flower petals, and some very pretty and tasteful effects can be obtained by this means. Variations of procedure result in different effects.

It is obvious that by pleating or puckering the leather in various ways, and by the use of the spray, considerable variatioin of different novel effects of this type can be produced, especially when two, three, or more colours are employed. For example, varied effects can be obtained by pleating the skin in different ways, and spraying with one colour from one side of the pleated skin, then spraying with a different colour from the opposite side.

### SPRINKLED MARBLING

From time to time there have been placed on the market sprinkled leathers, chiefly for book-binding purposes. A skin that is to be sprinkled is usually dyed a pale shade of brown, and sprinkled with a weak solution of ferrous sulphate. The skin is laid on a slightly inclined table, and the sprinkling is done from a brush—a painter's large sashôol being a serviceable brush for the purpose. The brush is dipped into the solution, and then all surplus liquor is well beaten out of it. Holding the brush over the skin with his right hand, the worker strikes it against a stout stick held in his left hand, in this way causing a fine spray of the iron solution to fall upon the skin. By continually moving the brush and continually striking the spray is evenly distributed over the skin. The application may be varied by spraying the dye or iron solution on to the leather by means of either a hand-spray of the scent spray type, or by a pressure-spraying machine.

A variety of coloured effects can be produced in this way, employing coal-tar colours and sprinkling with two, three, or more colours.

### BRONZED LEATHER

For fancy purposes, and for childre slippers and ladies evening shoes in pa cular, there is a demand for leather hav a metallic-bronze surface. The bro effect is brought about by accentuating natural tendency to bronze common many basic colours.

In order to produce a full bro effect, it is necessary to apply the dye to the leather in a very concentr solution, dissolving the dye in methyla spirit, and then applying the solution the leather, as in ordinary staining, w a sponge, brush, or by spraying.

Those dyes which have the gre tendency to bronze when used in ordin dyeing or staining are the most suital for obtaining the bronze effect; the m common of these being Magenta a Safranine, which produce a greenis bronze. Methyl violet produces yellowish-green lustre. Methylene bl gives a copper-coloured bronze, a Bismark brown a golden-bronze.

It is advisable in the case of leath that is to be bronzed, first to stain or d the leather a dark colour. A black d blue, or violet dyed leather is the m suitable to work upon for the bro effect.

A very strong dye-solution is nec sary in order to obtain the desired te sity of bronziness. The bronze th produced on the surface of the leath loose in its very nature, and unless fixed is easily rubbed off. The fix of the colour is usually achieved by th addition of shellac to the methylat spirit mixture, or by the application of waterproof finish to the leather aft bronzing—as, for example, a cellulo s shellac finish.

For bronze effects the following re cipes may be taken as typical:—

**Green Bronze**

| | | |
|---|---|---|
| M..genta | 12 | ozs. |
| S. ..anine | 3 | ozs. |
| R..by Shellac | 10 | ozs. |
| M..thylated Spirit | 1 | gallon |

**Copper Bronze**

| | | |
|---|---|---|
| M..hylene Blue | 10 | ozs. |
| ..mark Brown | 2 | ozs. |
| Shellac | 10 | ozs. |
| M..thylated Spirit | 1 | gallon |

The mixtures should each be placed ..n ..bottle, and kept in a warm room until ..e ..gredients are completely dissolved ..e bottle being occasionally shaken.

### GOLD AND SILVER LEATHER

There is an occasional demand for ..old and silver leather for certain purpos..., such as shoe uppers for ladies' evening ..ress shoes, theatrical purposes, and there ..is also a limited employment of gold-..ished leather in the fancy leather goods ..dustry and for decorating purposes, ..ookbinding, etc.

For the very highest quality gold and ..ilver leathers, actual gold and silver are ..employed; for commoner class leathers, ..bronze powders are used. The leather ..be decorated is usually highgrade mate-..al such as glace kid in the case of shoe ..ppers, and East India sheep or goat or ..d roan leather for the cheaper material.

Gold and silver kid is finished by the ..plication of beaten gold or silver leaf, ..to that which is employed for the ..uality gilding and decorating pur-.. The leather to be decorated is ..yed generally a dark colour, dried ..d by staking; the utmost care being .. to eliminate the maximum amount ..tch from the leather by straining ..ying at a high temperature. The ..ther is then sized with gold size, usually ..lightly snuff-buffing, and the gold ..silver leaf is applied by means of a flat camel hair brush, in exactly the same way as the gilder applies the leaf to picture frames, etc. The leather is finally sized with a transparent shellac or cellulose varnish after drying.

The advantage of gold and silver when applied in leaf form is that it is practically unaffected by atmospheric influences in wear, whereas the cheaper product the bronze powder is liable to considerable discolouration within a very short period of time.

### APPLICATION OF BRONZE POWDERS

As stated above, bronze powder is a much cheaper substitute for actual gold or silver. The bronze powders generally used are aluminium powder for silver bronze, and ordinary gold bronze powder for gold effects. The latter is a copper alloy, and in consequence of this and the liability of this material to tarnish by contact with grease, and also the fact that with surplus tannin the copper undergoes decomposition and conversion into copper acetate, which is green salt, the utmost care is necessary in the preparation of the leather before employment of these powders, with a view to eliminating the occurrence of this defect. The leather should be thoroughly washed free from surplus tannin, and should preferably have been degreased by employment of the ordinary benzine method of degreasing. No oils or fats, with the possible exception of mineral oil, should be employed for the purpose of lubricating or fatliquoring the leather, and if required to dye the leather a ground colour, basic dyestuffs should be used for preference, without the use of acetic or other organic acid. It is also an advisable precaution that the goods should be thoroughly well washed after dyeing, so as to remove any surplus dye; a much more efficient washing being necessary than after the ordinary dyeing process.

The leather is then dried, and the decoration with the "silver" or bronze powder is best done by spraying the leather with a celluloid varnish made by dissolving celluloid clippings in amyl acetate and alcohol; the powder being mixed to the required consistency into thi. cellulose vehicle, so as to make a suitable paint which can be satisfactorily sprayed on to the surface of the leather.

It is advisable, after giving a good coating of the bronzing fluid, to allow the leather to become thoroughly dry, drying at a comparatively high temperature, so as to remove the last traces of the cellulose solvent, and then attach the bronze [illegible] firmly to the leather by spraying ove[illegible] a shellac or clear cellulose varnish.

The addition of hygroscopic [illegible] like glycerine to the cellulose or sh[illegible] varnish should not be made, and the [illegible]tomary addition of castor oil, with a [illegible] to producing a greater amount of plia[illegible] should also be omitted, especially i[illegible] case of gold or copper bronze. Thi[illegible] very short time will bring about the [illegible] composition above referred to, with t[illegible] resulting conversion of the golden b[illegible] into a dull green colour.

## —Removal of Stains from Fabrics.

,BRICS used in our daily life are made ιom materials such as cotton, silk, wool ,rtificial silk. These fabrics often stained with substances such as oil, er, ghee, fats, fruit juice, tea, coffee. ron rust, paint, varnish, iodine, l, mildew, perfume, etc. These stains be removed without damaging the e But there are some stains which ot be removed and are, therefore, t left alone. Ordinary stains such as stated above can be removed by the ation of the correct reagent, and this turn depends upon ascertaining the nce causing the stain and the mateom which the fabric is made. If the s dyed it is also necessary to know. der to remove the stain without reng the colour of the dyed fabric, her the dye used is fast or fugitive. n reagents which can be safely used removing a particular stain from a n fabric, if applied on silk or wool, lamage the cloth. Then again it must ne in mind that fresh stains can be easily removed than old stains and, fore, efforts to remove the stain l be made as early as possible. In ase, the cloth should be washed hot soap solution immediately on ring the stain. Several stains can ved easily by the mere application n soap solution, or by holding the ght on an empty vessel and pouring t hot water from a kettle on the l spot.

the cause of the stain is not known nnot be identified then much diffill be experienced in selecting the e reagent for removing the stain. h cases, it is necessary to carry out l trials with different reagents which itable for the nature of the fabric. : material from which the fabric is made is not known, it is necessary to conduct a simple test. Some fibres may be taken out from the fabric and held in the hand and the gentle flame of a match applied to them. Cotton and artificial silk will burn rapidly, giving a smell of burning paper and leaving a little ash. Wool and silk will, on the other hand, burn rather slowly, emitting a disagreeable smell of burning feather, and have a black bead at the end. If the fabric is dyed, trials will have to be carried out with different reagents or hot soap solution on a corner of the fabric to ascertain whether the colour is fast or fugitive. In some cases, it will be found that the stain cannot be removed without removing the colour of the cloth at the same time.

Stains are removed by different methods of treatment such as solvent, chemical and absorption.

### SOLVENT METHOD

In this method the stain is dissolved so that it may pass from the fabric on to a blotting paper placed underneath the fabric. The stain is absorbed by the blotting paper and the solvent in the fabrics evaporates. Before proceeding to remove the stain, the portion of the fabric which is stained should be washed in hot soap solution in preferably a solution Igepon T Soap. The fabric should then be dried.

Now a pad consisting of a few sheets of blotting paper, is placed on the table and the cloth containing the stain laid on the top of the blotting paper. A small quantity of the reagent is poured in a small cup. A clean cotton muslin rag is then dipped in the reagent, the excess quantity squeezed and the rag pressed gently on the stain from the outer side of the stain to the centre. The solvent will carry the stain into the blotting paper. At every

application of the solvent, a clean rag and a fresh blotting pad should be used. The excessive use of reagent at every application should be avoided. in order to prevent the formation of a ring around the stain. The portion of the cloth stained may finally be washed in cold water. In removing stains, the rag dipped in the reagent should be pressed gently but not rubbed on the fabric. as it will cause the dissolved stain to spread out on the fabric. In some cases more than one solvent will have to be applied in succession in order to remove the stain. As many of the solvents are inflammable. they should be kept at a safe distance from any flame.

### CHEMICAL METHOD

In this method. the stain is decomposed or bleached and the chemical removed by washing. Before proceeding to remove the stain, the portion of the fabric which is stained should be washed with hot soap solution. The solution of the chemicals is first poured in a small cup. A white cloth is placed on a table. and the fabric containing the stain laid on the cloth. A clean cotton muslin rag is then dipped in the solution and the rag pressed gently on the stain. After the stain has been removed, the fabric is washed in cold water to remove the chemical.

### ABSORPTION METHOD

This method is applicable only in the case of grease and lubricating oil stains. As magnesium carbonate has the property of absorbing oil and grease, it is rubbed on the stain and left until the oil is absorbed, and then brushed off. For removing old stains, powdered magnesium carbonate is mixed with benzol (not petrol) and then the paste is rubbed on the spot and allowed to dry and brushed off. This is useful on heavy garments such as coats.

### HOT APPLICATION

This mehod is applicable in the case of stain produced by rain-water on silk fabrics. A white cloth is laid on the table, and the stained fabric is placed over it. A wet cloth is then placed on the stained cloth, and a dry cloth is placed over it. A hot iron is pressed on the cloth in order to remove tht stain.

1. Nature of stain—Milk, butter ghee, vegetable and animal oil and fats.

   Cloth of fabric—Cotton, silk, wool and artificial silk. Reagent to be used—Carbon tetra chloride. Method to be adopted—Solvent.
2. Nature of Stain—Tea, Coffee Cocoa. Chocolate, Fruit juice, wine and bear.
   - (a) Class of fabric—White cotton and artificial silk. Reagent to be used—Sodium hypochlorite solution (1 oz. of sodium hypochlorite in 10 oz. cold water). Method adopted—Chemical.
   - (b) Class of fabric—White silk wool and coloured cotton and coloured artificial silk. Reagents to be used—Ammonia solution (1 oz. ammonia in 5 oz. water) followed by hydrogen peroxide (12 vols strength).
   - (c) Class of fabric—Coloured silk and wool.

     Reagents to be used—Ammonia solution (1 oz. ammonia in 5 oz. water).

     Method adopted—Chemical.
3. Nature of stain—Ink and iron rust.
   - (a) Class of fabric—White cotton and artificial silk.

     Reagents to be used—Hot oxalic acid solution (½ oz Oxalic acid in 16 oz. of water) followed by sodium hypochlo

rite solution (1 oz. in 10 oz. of water).
Method adopted—Chemical.

(b) Class of fabric—Coloured cloth and artificial silk.
Reagent to be used—Hydrochloric acid (1 oz. acid in 15 oz. water) followed by washing and then treatment with ammonia (1 oz. ammonia in 5 oz. water).
Method adopted—Chemical.

(c) Class of fabric—White silk and wool.
Reagent to be used—Warm oxalic acid solution (½ oz. oxalic acid in 16 oz. water) followed by washing and then treatment with ammonia (1 oz. ammonia in 5 oz. water).
Method adopted—Chemical.

Nature of stain—Iodine.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagent to be used—Sodium thiosulphate solution (1 oz. thiosulphate in 5 oz. water).
Method adopted—Chemical.

Nature of stain—Grease, tar and wax.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagent to be used—Coconut oil followed by hot soap washing and then treatment with carbon tetrachloride.
Method adopted—Solvent.

Nature of Stain—Paint and varnish.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagent to be used—(1) Methylated spirit followed by turpentine and soap washing finally after drying.
(2) Carbon tetrachloride.
(3) Mixture of acetone and amylacetate (1 oz. acetone and 1 loz. of amylacetate).

7. Nature of stain—Blood.
(1) Class of fabric—White cotton and artificial silk.
Reagent to be used—Sodium hypochlorite solution (1 oz. in 10 oz. of water).
(2) Class of fabric—Wool and silk and coloured cotton and artificial silk.
Reagents to be used—Acetic acid (2 oz. concentrated acetic acid, ½ oz. Common salt in 19 oz. water) followed by washing and treatment with ammonia (1 oz. of ammonia in 5 oz. water).
Method adopted—Chemical.

8. Nature of stain—Mildew.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagent to be used—Hvdrochloric acid (1 oz. in 15 oz. water) followed by wash and treatment with hydrogen peroxide (12 vols. strength).
Method adopted—Chemical.

9. Nature of stain—Perfume.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagents to be used—Ammonia (1 oz. in 5 oz. water) and oxalic acid in 16 oz. water), alternately.
Method adopted—Chemical.

10 Nature of stain—Perspiration.
Class of fabric—Cotton, silk, wool and artificial silk.
Reagent to be used—Hydrogen peroxide (12 vols. strength).
Method adopted—Chemical.

In preparing hypochlorite solution take 1½ oz. of soda ash and dissolve it in 5 oz. of cold water. Then take 2 oz. of bleach-

ing powder (containing 35 p. c. available chlorine) and dissolve in it 15 oz. of cold water. Mix the two solutions, stir and have it undisturbed for 20 minutes. The clear solution is sodium hypochlorite and this should be poured into another vessel without disturbing the sediment. As the sodium hypochlorite solution is not stable, it should be prepared fresh evrey time.

In conclusion it is not out of place to mention the whole list of chemicals to be stored in carrying out this business.

Methylated spirit, acetone, amyl acetate, carbon tetrachoride, turpentine, coconut oil, soda ash, liquor ammonia, ([illegible] vols.), bleaching powder, acetic acid oxalic acid, hydrochloric acid, sodium thiosulphate.

# —BENGAL HOSIERY INDUSTRY

…E first hosiery factory in Bengal …s started in the 1890 at Kidderpore … the Municipal Wards of Calcutta, …d by the establishment of a bigger … in the year 1892, at the same place, …full contingent of British machinery …itish experts at the initiative and … the management of some of the …enterprising citizens. During its … of the past 61 (sixty one) years …dustry has passed through many …des. While on the one hand it …doubtedly received impetus for pro- …s a result of events like (a) politi- …heavals in the country followed by … Swadeshi" movemetns (b) two … world wars and (c) protective …es against foreign imports taken by …overnment, it has on the other hand …enced severe set backs, which have …es shaken the very foundations of …dustry and have swept away many …tory from their existence. Some of … adverse factors were (a) change … world conditions, which prevented …tion of its numerous essential … etc. (b) long period of competi- …ith the cheap and spurious … imports and (c) occasional … trade depressions caused by various …

…s under the shadow of the unfair … competition from Japan in the …923 that this Association took its birth. Since its inception it has naturally identified its existence with that of the industry and plunged headlong in the act of forging its destiny. But for the two outstanding achievements the industry would not be what it is to day. Through the initiative of The Hosiery Manufacturers Association and its sustained efforts for years by various deputations and representations to the Government of India and the Tariff Boards of 1926, 1932 and 1935 the necessity of assistance to the industry was impressed on the Government, which adopted effective measures of protection by two successive legislations in 1934 and one in 1935. Then again during the last great war, when in the name of all-out war efforts, the then India Government practically stopped the supply of yarn to the industry for civil purposes, the Association undertook Government orders and kept working throughout the war period most of the medium-sized factories under its membership, which would otherwise have closed down for want of raw materials.

The position of the industry in West Bengal at a glance during the last twelve years is given below. There being no authentic statistical records available the following figures have been worked out on the informations collected privately as an workable basis:—

**PROBLEMS**

| | 1938 | 1949. | 1950. |
|---|---|---|---|
| Complete or Composite factories | 250 | 314 | 430 |
| … knitting machines installed | 1,500 | 2,000 | 3,000 |
| … hosiery sewing factories | Not ascertained | 500 | 500 |
| … of socks factories worked by manual labour | 150 | 250 | 250 |
| …stment in Block Capital | Not ascertained | Rs. 2 Crores | 3 Crores |
| …al capital outlay | " " | Rs. 6 " | 7 " |
| …ual production capacity of the plant installed—Quantity (in lbs.) | " " | 168 Lakhs | 252 Lakhs |
| —Value (in Rs.) | " " | 756 " | 1,134 " |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. Consumption of finished products in West Bengal—(a) Quantity (in lbs.) ..... | ,, | ,, | 18 | ,, | 18 | ,, |
| (b) Value ..... ..... | ,, | ,, | 81 | ,, | 81 | ,, |
| 9. Exportable surplus of finished goods | | | | | | |
| (a) Quantity (in lbs.) ..... ..... | ,, | ,, | 150 | ,, | 234 | ,, |
| (b) Value (in Rs.) ..... ..... | ,, | ,, | 675 | ,, | 1,05[illegible] | ,, |
| 10. Workmen employed ..... ..... | | 6,000 | 10,000 | ,, | 10,000 | ,, |
| 11. Wages paid per month ..... ..... | Not ascertained | | 7½ | ,, | 7½ | ,, |

In dealing with the problems of the industry it would be necessary to bear in mind some of its inherent difficulties owing to its being a typical medium scale industry—unlike cottage industries, where simple and crude machineries and equipments are employed. This industry requires various types of complicated machines requiring precise adjustments. Its raw materials are not primary products as are easily procureable but are themselves the products of some big scale industries viz. yarn, sewing thread, bleaching chemicals, starch, dyestuffs, etc. Some of these materials including needles and sinkers are imported from abroad and are thus subject to occasional short supply and speculative prices. Like the big-scale industries it requires highly technical services for erection and maintenance of its machinery but most of the units being very small in size cannot afford to maintain their own technical staff. Consequently the entrepeneur, who have to look after all the departments of their factories personally viz. management, supervision, finance, technical service, dyeing and bleaching and marketing, have invariably to work under constant and heavy strain.

These factories therefore are very weak in their power of resistance and are liable to succumb easily to any strong extraneous forces of adverse circumstances. The services of a strong responsive and active Association are certainly helpful to them but for their proper maintenance and development the fostering care of a national Government is essential.

## CONTROL

The present problems of the industry have been mainly created by the shorta[ge] of its raw materials and the contr[ols] i[m]posed on it. The committee is not op[posed] to the principle of control. Comp[ulso]ry apportionment of available raw materia[ls] among the factories on equitable basis [is] unavoidable so long as its scarcity con[ti]nues. But our grievances are with [rega]rd to the administration of the contr[ol] both in respect of Procurement a[nd] Distribution.

## PROCUREMENT

As the procurement of yarn [is] administered by the Central Gover[nme]nt the Association have been negotiating [a]long with the Industries Ministry a[nd] particularly with the Textile Commis[sion]er for increasing the monthly quota of [co]tton yarn for West Bengal. They have al[wa]ys pleaded their inability to increase the [sup]ply on the ground of shortage of cotto[n]. The Association proposes that [the] curtailment in the supply of raw mat[erials] due to shortage of cotton, in respect [of] sections of the Indian Textile Ind[ustry] should be in equal proportion as comp[ared] with their normal consumption dur[ing] particular period when the proble[m] of scarcity of cotton did not appear.

## DISTRIBUTION

It is not difficult to imagine how [the] continued short supply of raw mat[erials], almost on a starvation level, is seri[ously] affecting the industry. It is proving [too] much for the management of the [sma]ll factories to carry on any longer under t[he] present distressing conditions in addition to their inherent difficulties explain[ed] above.

The necessity for a more tender and siderate handling of the factories by Government is becoming more and essential. Every care should be n to avoid such steps as would involve r suspension of issue of yarn either count of protracted inspection or ex- tion or on the ground of some l lapses on the part of some fac- or other. Rigid pursuit of the letters rder or enforcement of strictness pline without being tempered with ble leniency may prove fatal to ctories. Any rule or order, affect- long practices in the trade, should ved. Factories failing to submit onthly Application cum Declara- the 15th of any month should not be penalised by the cancellation of their full quota for the month.

The permits for monthly quotas have seldom been issued regularly. The intervals sometimes extend to 6 or 7 weeks, resulting in longer idleness for the factories. Shortage in the allotment, due to mistake in inspection reports or other reasons, is not often restored for the period. Many important letters affecting the vital interest of some factories remain unanswered for a long time obviously due to indecision. The measures taken by the Directorate in the matter of distribution of Egyptian yarn during the previous 3 allotments resulted in huge accumulation and maldistribution of the yarn.

### COUGH BALSAM

| | | |
|---|---|---|
| Oil of anise | 15 | min. |
| Liquid extract of liquorice | 1½ | fl. oz. |
| Syrup tolu | 10 | fl. oz. |
| Simple syrup to make | 1 | pint. |

### PHOTOGRAPHER'S OINTMENT

The following protects the hands from photographic chemicals:- -

| | | |
|---|---|---|
| Best castile soap, in fine shavings | 1 | ounce. |
| Water | 1 | " |
| Wax | 1 | " |
| Ammonia | 45 | minims. |
| Lanolin | 1 | ounce. |

The soap is dissolved in the water heated for that purpose, the wax mixed in with much stirring, and, when all is in solution, the ammonia is added. When clear, the lanolin is put in, and then, if the mixture is very thick, water is added until the whole has the consistency of honey. Keep in a covered stoneware jar. The hands should be first washed with ordinary soap, and then, while the leather is still on them, a bit of the mixture about the size of a hazel nut is rubbed in until all is absorbed, and the hands are dry. At the close of the work, the film of wax is washed off in warm water and a little lanolin rubbed into the hands.

### SORE THROAT TABLETS

| | | |
|---|---|---|
| Potasium Chlorate | 10 | grains. |
| Sugar | 80 | " |
| Borax | 8 | " |
| Eucalyptol | 0.125 | " |
| Thymol | 0.500 | " |
| Menthol | 0.025 | " |

Add glycerin and distilled water to make a paste. Mould and dry. The above composition enough for 200 tablets.

### ANTI-ACID STOMACH TABLETS

| | | |
|---|---|---|
| Sugar | 1 | lb. |
| Calcium Carbonate | ½ | " |
| Pappermint essence | 2 | drams. |

Mix sugar and carbonate with 1½ pints of water and boil until mass will set on a cold spoon. Cool and add 2 drams of essence of of Peppermint while stirring is still possible. Spread thin over a flat pan and cut into ½ inch cubes.

### ANALGESIC BALM LINIMENT

| | | |
|---|---|---|
| Methyl salicylate | 30 | parts. |
| Menthol | 10 | " |
| Saponin | ½ | part. |
| Lanolin | 32½ | parts. |
| Chloroform | 5 | " |
| Water | 100 | " |

Melt the lanolin and incorporate in it methyl salicylate. Remove from the source of heat and add the menthol dissolved in chloroform. Finally mix the saponin in water. Stir thoroughly and then put in [illegible]

### SULPHATHIAZOLE OINTMENT

| | | |
|---|---|---|
| Anhydrous lanolin | 47.5 | [illegible] |
| Sulphathiazole, finely divided | 5 | " |
| Vanishing cream or potassium stearate | 47.5 | " |

Melt the lanolin and add the v[illegible] cream slowly with adequate heating, [illegible] produce a good fluffy cream. Add the fine-ly divided sulphathiazole and contin[illegible]ing until a uniform mixture is obtained. [illegible] mixture is readily emulsified, add [illegible] four drops ethanolamine and contin[illegible] heating.

This ointment is particularly ad[illegible] various skin irritations, eczema, and [illegible] skin diseases.

### RINGWORM OINTMENT

| | | |
|---|---|---|
| Salicylic acid | 2 | [illegible] |
| Creosote | 1 | [illegible] |
| Resorcin | 1 | [illegible] |
| Benzoated lard | 4 | [illegible] |

Triturate the ingredients in a mort[illegible] the lard and then pack in pots.

### AGNIMUKA CHURNA

| | | |
|---|---|---|
| Asafoetida | 1 | [illegible] |
| Acorus calamus | 2 | [illegible] |
| Long papper | 3 | " |
| Ginger | 4 | " |
| Ajowan | 5 | |
| Chebulic myrobalan | 6 | |
| Plumbago root (Chitramula) | 7 | |

Reduce the ingredients into powd[illegible] and pass through a cloth.

Dose :- 20 to 40 grains with whey.

### PIMPLE LOTION

| | | |
|---|---|---|
| Crystallised alum | 1 | [illegible] |
| Sodium chloride | 1 | |
| Sublimed sulphur | 1 | |
| Sugar candy | 2 | |
| Spermaceti | 2 | |
| Elder-flower water | 3 | |
| Distilled water | 3 | |
| Brandy | 10 | |

Reduce all the solids into fine pow[illegible] rub up with the mixed liquids. This [illegible] to be applied at intervals during the d[illegible] linen rags, which should frequently be [illegible] It is an effectual and quick remedy f[illegible] tions on the face.

## —Recipes for Small Manufacturers

### CAMPHOR ICE

[illegible]amphor ice contains 10 to 25 per cent. of [illegible], which is added to the melted fats [illegible] they have dissolved. It is then poured [illegible] moulds and the blocks wrapped in tin foil.

| | | |
|---|---|---|
| [illegible]amphor powder | 150 | parts. |
| [illegible]resine, white | 50 | „ |
| [illegible] paraffin | 250 | „ |
| [illegible]ft paraffin, white | 500 | „ |

### WOOD LACQUERS

| | | |
|---|---|---|
| [illegible]nylacetate | ½ | gallon. |
| [illegible] acetate | 1 | „ |
| [illegible] alcohol | ½ | „ |
| [illegible] | 1½ | gallons. |
| [illegible] solution spirit | ½ | gallon. |
| [illegible] cellulose | 6½ | lbs. |
| [illegible] phthallate | ¾ | lb. |

[illegible] in a stoppered vessel and keep aside [illegible]olve.

### MUKHBILAS

| | | |
|---|---|---|
| Coriander seed | 1 | tola. |
| [illegible]niseed | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] of cardamom major | 1 | „ |
| [illegible] of cardamom minor | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] rose petals | 1 | „ |
| [illegible] | 1 | „ |
| [illegible] | 1 | „ |

[illegible] one tola each of the ingredients ex[illegible] last two and soak them in good rose [illegible] 12 hours. Then bray them together [illegible] form and incorporate chua and [illegible]

### LACQUER FOR SHOE HEELS

| | | |
|---|---|---|
| [illegible] acetate | 12 | parts. |
| [illegible]ne | 1152 | „ |
| [illegible] | 14 | „ |
| [illegible] alcohol | 3 | „ |
| [illegible]strial spirit | 7 | „ |
| [illegible]etin | 10 | „ |

[illegible] in a stoppered bottle.

### POLISHING CLOTH

| | | |
|---|---|---|
| [illegible] acid | 1 | lb. |
| [illegible] acid | ½ | oz. |
| [illegible]ine | 1 | „ |

[illegible] together, remove from fire and add [illegible] or methyl salicylate or terpineol, ½ oz. [illegible] cotton flannel into desired size, dip in [illegible]ure till thoroughly saturated, then run [illegible] a tight wringer. Fold and wrap in [illegible]aper.

### LEMON SQUASH

Lemon squash is made with the expressed juice of lemons to which suitable amounts of sugar and water are added; occasionally a little lemon oil is added to flavour. The lemon juice for this purpose is obtainable packed or cloudy, the cloudiness being due to the presence of pulp which floats in the liquid.

Orange squash is made in the same way from expressed juice of orange.

### LEMON SYRUP

It is made with tincture of sweet orange peel and oil of orange.

I

| | | |
|---|---|---|
| Oil of lemon | 2 | minims |
| Alcohol (90%) | ½ | oz. |
| Dissolve and add kieselguhr (or kaolin) | 1 | dr. |
| Water | 1 | oz. |

Allow to stand a day or two shaking occasionally; filter and add to a syrup made as follows:—

| | | |
|---|---|---|
| Sugar | 12 | oz. |
| Citric acid | 1½ | dr. |
| Water | 7 | oz. |

The oil of lemon and alcohol may be replaced by 1 oz. of tincture of fresh lemon peel.

II

| | | |
|---|---|---|
| Oil of lemon | 2 | dr. |
| Otto of rose | 2 | m. |
| Alcohol (90%) | 2 | oz. |
| Citric acid | 3 | „ |
| Syrup | 2 | gal. |

Prepare as above.

### SILVERING POWDER

| | | |
|---|---|---|
| Silver chloride | 1 | tola. |
| Common salt | 1½ | tolas. |
| Washing soda | 3 | „ |
| White chalk powder | 2½ | „ |

Powder each separately and weigh in a well dry condition and mix well the whole and pack it in 1 oz. size screw top or wide-mouthed cork bottle.

For silvering the articles made of brass, copper, German silver, etc., first clean them well with chalk powder and wash with clean water. After cleaning the article from dirts and traces apply this silvering powder with a small piece of clean cotton rag when the article is wet. Rub briskly all over the place with this powder for some time and wash with water. Two or three coats in this way will give a good deposit of silver on the articles. To get cleaner and brighter surface on the article it must be cleaned thoroughly before applying this powder.

## —IN THE FIELD OF INVENTIO

### ONE MINUTE ALLOY ANALYSIS

*An automatic photo electric instrument capable of obtaining the complete chemical analysis of an aluminium alloy in less than one ninute, and producing a written analytical re- ort in duplicate, was described recently by Mr. J. R. Churchill. of the Aluminium Com- any of America.* **The instrument, called a uantometer, is able to provide a true control nalysis, in as much as analysis can be per- ormed, while the aluminium is being process- d. and concentrational adjustments can be nade immediately if the product does not meet pecifications. Where high uniformity of pro- uct is required to meet the exacting needs of uch customers as the aircraft industry, the utomatic instrument produces faster, less ex- ensive and more reliable test results than btained by laboratory technicians.**

—CHEMICAL AGE.

### IEW U. S. TINPLATING TECHNIQUE

Savings of up to 50 per cent. in the use of in are claimed for a new tinplating technique ecently perfected by the Weirton Steel Com- any, West Virginia. Under methods in general ise, tinplate receives the same weight of coat- ng on both sides. In the weirton process one ide is coated sufficiently to protect the con- ents of the can, while the other side is treated vith only the amount of tin necessary to pro- ect the exterior from exposure.

—CHEMICAL AGE.

### IEW SULPHUR RECOVERY PROCESS

Recovery of elemental acid grade sulphur rom surface deposits by a new refining process s reported by the Chemical Construction Cor- oration, New York, a subsidiary of the Ameri- an Cyanamide Company.

**The method involves the grinding of native ulphur bearing ores to below 28 mesh size and uspending the finest in water. The mixture is hen heated to above the melting point of sul- hur to separate it from the gangue. After ooling, the final mix is subjected to froth lotation. Sulphur is floated off with the froth nd filtration yields a product ready for acid nanufacture. Relatively simple equipment omparable with the well-known French process s employed and an effective sulphur recovery f 90 per cent. or more is claimed.**

**Should Chemical Construction Corpora- ion's new process live up to its preliminary ex- ectations it will spell the utilisation of large urface deposits of sulphur bearing ores hroughout the world, and it should prove onsiderably cheaper than a pyrites acid plant s a sulphuric acid producer.**

—CHEMICAL AGE.

### VIBRATING TABLE

*Containers of all shapes, size... and mate- rials can be effectively vibrated with the Koh Vibrating Table.*

**The table is of all-steel construction. The table top is securely bolted to mould... mountings which isolate it from the base; vibration is not transmitted to the f... of the machine. An unbalanced weight rot... by a small electric motor causes the vibrati... The vibrator is secured to the table top by ... mountings to eliminate "contact rattle." The surface of the table is slightly dashed to ... containers sliding off, and is covered w... to eliminate noise.**

—CHEMICAL P...

### HOT AIR OVEN

A new type of hot air oven, desig... Electricals Ltd., has just been anno... Difficulty in the past has existed in ob... very close temperature control but it is ... that this oven, by reason of its design a... struction, virtually eliminates this trou...

Temperature range of the oven is ... to 300°C. and it can be used for any te... ture within these limits. Internal mea... ments are 17 ins. cubs.

A thermostat control gives the desi... perature at all parts of the oven to with... per cent. with shelves loaded, althou... limits are finer than this for any on... This very close temperature control is ob... by special features the principles of the... a hot air bath surrounding the interior ... oven, in which the air is circulated by ... An additional fan agitates the air in th... interior. The heat insulation is such th... exterior of the oven remains cool at all ...

Due to the unique air bath princip... it is possible to avoid switching the who... of heating elements on and off throug... thermostat circuit, a system which inv... gives rise to great fluctuations in the oven ... The small wattage controlled by the the... plus the extra elements controlled by a ... tion rotary switch when required to atta... temperature, provides very small temp... fluctuations.

**A warning light to indicate failure ... fan, and a pilot light on the thermost... fitted on the control panel.**

**The oven is useful for all laborato... pur- poses and is ideal, by virtue of its temp... ature control, for the sterilization of syringes, etc. at 165°C.**

—CHEMICAL PRO...CTS

# —FORMULAS, PROCESSES & ANSWERS

### [illegible]ALLING SIGNBOARDS

3[illegible]2 V.A., Madura—Desires to know the [illegible] of enamelling signboards.

[illegible] enamelled wares receive first a coat of [illegible] enamel—the fundamental coat, since on [illegible] to be placed the future colours—consist-[illegible] of a coating of glass. This operation [illegible] by a coating of white or glazing the [illegible] colour being afterwards laid on the [illegible] signboard plates, after being levelled or [illegible] are bevelled, and dipped into a bath of [illegible]ric acid composed of equal parts of [illegible] water. They are next heated to redness [illegible] the scale, and cleared in dilute sulphu-[illegible]; then rinsed in cold water well scoured [illegible] sand, again rinsed, but in boiling water, [illegible]wards dried. The enamel mixings are [illegible] either in the form of a powder or as a [illegible] paste, the latter for preference. The [illegible] paste is poured over the plate, or the plate [illegible] into the liquid, any surplus being [illegible] with a cloth. The first or grey coat is [illegible] at 160°C and is afterwards fused at a [illegible] to a white heat about 1200°C this [illegible] done in a muffle furnace. This first coat [illegible] impressed or fused into the body of the [illegible] thus obviating cracking or peeling off. It [illegible] to cool slowly and uniformly. The [illegible] coat of white is then applied. It must be [illegible] liquid as possible, and fused at a lower [illegible]ture, about 1050°C so as not to interfere [illegible] first grey coating. The coloured coat-[illegible] are similarly applied. The mixings are [illegible] thoroughly ground up, well mixed, fused [illegible] suitable crucible, and run into cold water [illegible] them brittle and easy to grind. After [illegible] they are reground very fine. The grind-[illegible] is of a special character, so constructed [illegible] particles of iron are prevented from [illegible] into contact with the material being [illegible], as the iron would cause distinct dis[illegible]. The grey mixing should be kept in [illegible] just liquid enough to pour, a suitable [illegible] of water being added only when the [illegible] is required for work. The white is [illegible] and kept in covered tubes till used. The [illegible] must be well protected from dust. The [illegible] points to be carefully followed are: [illegible] clean the plates before use. Fuse [illegible] at such a heat that it may only coat the [illegible] and eat its way into the surface of the [illegible]: this is only done at a white heat, and at [illegible] temperature than the white, so that it [illegible] be altered when applying the white. [illegible] compositions have the same capacities for [illegible] and contraction as the metals upon [illegible] they are applied; but a most important [illegible] slow and uniform cooling. The composi-[illegible] of the various glazes is as follows: The [illegible] ground—No. 1: Any kind of glass 49 [illegible] oxide of lead 47 parts, fused borax 4 parts. [illegible] Quartz, 67½; borax 29½; enamelling soda 3, [illegible] Silica 65; borax 14; oixde of lead 4; clay, [illegible] magnesia 2 No. 4. Any kind of glass 61; red-[illegible], 22; borax 16; nitre, 1. The white ground—[illegible] Felspar, 33; borax 22½;; quartz 16½; oxide [illegible] tin, 15; soda 8; fluorspar, 3¾; saltpetre, 2¼. No. 2 Cullet, 20; lead 52; arsenic, 4½; powdered flint, 15; soda, 4½; nitre 4. No. 3 Silica powder 30; borax 17; oxide of tin, 18, soda, 8½, nitre 7½; white-lead, 5¼; magnesia, 4; silica powder 4. For the various shades or colours, the following are used: Blue-silicate of cobalt. Violet—peroxide of manganese. Green oxide of copper, with, if necessary, a little oxide of iron. Naples yellow or orange—red oxide of iron and an antimony preparation mixed to give the desired tint. Red-sulphate of iron and alumina. Brown, black and purple—oxide of iron mixed with a certain proportion of clay. Black-oxides of cobalt, iron and manganese.

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### RUBBER BALLOONS

13 M R.I., Jogeshwari—Desires to know a good formula of making rubber balloons.

Toy balloons are made by both straight and coagulating dipping from latex. The latex composition should be adjusted so that the cured film will have low modulous and be free of odour and taste.

| | | |
|---|---|---|
| Rubber latex 60 p.c. | 100.00 | lbs. |
| Zinc oxide | 0.50 | „ |
| Sulphur | 1.00 | „ |
| Z. D. C. | 0.83 | „ |
| Casein sol. 10 p.c. | 1.00 | „ |
| Organic colour | 2 to 3 | „ |

First prepare the casein solution by dissolving 10 parts of casein in 90 parts of ammonia for it. Then take necessary amount of this casein solution and triturate in it the zinc oxide, Z.D.C. and colour. Then incorporate the mixture into the latex. Stir thoroughly. Then allow the bubbles to escape and dip the forms after dipping them in calcium chloride solution (Calcium chloride 10 parts, water 40 parts and methylated spirit 40 parts) Take out the forms slowly and then keep them erect to dry. When dry make a neck by pushing.

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### ROSIN PLASTER

64 V.Y.S., Bijapur—Wishes to have the formula of preparing rosin adhesive plaster.

To prepare rosin plaster first prepare lead plaster in the following manner:—

| | | |
|---|---|---|
| Litharge | 6 | lbs. |
| Olive oil | 1 | gallon. |
| Water | 1 | quart. |

Boil all together on a slow fire, constantly stirring to the consistence of a plaster, adding a little boiling water if nearly the whole of that used in the beginning should be consumed before the end of the process.

Now take 3 lbs. of this lead plaster. Warm it and then to this melted mass and rosin in fine powder, ½ lb. also liquefied by gentle heat and mix.

## ARTIFICIAL BEESWAX

106 K.A.K., Bangalore—Wants to have a formula of artificial beeswax.

This is obtained by mixing the following substances, in approximately the proportions stated:—

| | Parts by Weight. |
|---|---|
| Paraffine | 45 |
| White Japan vegetable wax | 30 |
| Rosin or colophonies | 10 |
| White pitch | 10 |
| Tallow | 5 |
| Ceresine, colorant | 0.030 |
| Wax perfume | 0.100 |

If desired, the paraffine may be replaced with ozokerite, or by a mixture of vaseline and ozokerite, for the purpose of varying the fusing temperature, or rendering it more advantageous for the various applications designed. The following is the method of preparation: Melt on the boiling water bath, shaking constantly, the paraffine, the Japan wax, the rosins, the pitch, and the tallow. When the fusion is complete, add the colorant and the perfume. When these products are perfectly mingled, remove from the fire, allow the mixture to cool, and run it into suitable moulds. The wax thus obtained may be employed specially for encaustics for furniture and floors, or for purposes where varnish is employed.

## RED LEAD

124 A.E.W., Nasik—Wishes to have a good process of manufacturing red lead.

Red lead is prepared on the large scale in a furnace with the floor slightly concave and the roof arched, presenting a general resemblance to a baker's oven. The lead in thin sheets free from iron is placed on the floor, and gradually raised to a red heat, whereby it melts and becomes covered with a pellicle of monoxide, which is removed by means of a long iron scraper, and the pellicles, as they successively form, are scraped off until the whole of the metal has been converted into the monoxide. The product is subjected to further heating (calcination) in presence of air, with occasional stirring, for some time, in order to oxidise any remainder particles of metallic lead; it is thus rendered yellow, and constitutes lead monoxide, or massicot as it is technically called.

This is taken out of the furnace, thrown upon a level pavement, and cooled by being sprinkled with water. It is next reduced to fine powder by trituration and levigation. The paste thus obtained is thrown into a cistern full of water. And then it is stirred by means of a rod. It is then set aside for a few minutes the fine particles of yellow lead monoxide settles at the bottom. The clear water is syphoned off and thrown away. The lead monoxide is taken off and dried in the sun or otherwise. The dried mass is then spread thinly in a number of shallow iron trays (about 12 inches square and about 4 to 5 inches deep). The trays are next placed into another furnace, if the first is to be discharged. The furnace on being filled up with trays is heated nearly to redness (600° to 650°F). Then the fire is extinguished and the furnace is allowed to cool down slowly. The door of the furnace should be kept open, so that the lead monoxide may combine with an additional quantity of oxygen, and become the red oxide. This is taken out, and, after it has passed through a fine wire sieve, it is packed in barrels for the purpose of commerce.

## LITHARGE

124 A.E. W., Nasik—Wants to have a process of manufacturing litharge.

Litharge or oxide of lead is obtained perfectly pure by expelling the acid from nitrate of lead by exposing it to heat in a platinum crucible; or, still better, by adding [illegible] ammonia to a cold solution of nitrate of lead until the liquid becomes faintly alkaline, washing the precipitate with cold water, drying and heating it to moderate redness for 1 [illegible]

On a commercial scale litharge is manufactured by scraping off the drops that form on the surface of melted lead exposed to a current of air, and heating it to a full red heat to melt out any undecomposed metal. The fused oxide, on cooling, forms a yellow or brownish semicrystalline mass, which readily separates into scales; these, when ground constitute the "powdered litharge" of commerce. The yellow variety is obtained when the metal is only moderately heated. It is usually called massicot.

## AGARBATTI

133 R.V., Dinapore Cantt.—Wishes to have a formula of agarbatti and also pan ka masala.

| | | | |
|---|---|---|---|
| Musk | | 20 | gr. |
| Ambergris | | 20 | „ |
| Powdered | benzoin | 20 | oz. |
| „ | camphor | 2 | „ |
| „ | cinnamon | 2 | dr. |
| „ | nitre | 2 | „ |
| „ | charcoal | 4 | oz. |

Make a thin paste with mucilage of tragacanth. Sticks are then made by dipping and taking out slowly thin wooden or bamboo splintres into this emulsion. Dry in the sun and store for use.

## PAN KA MASALA

| | | |
|---|---|---|
| Coriander seed | 1½ | tola. |
| Aniseed | 1½ | „ |
| Parsley | 1 | „ |
| Nutmeg | 1 | „ |
| Ajawan | 1½ | „ |
| Saffron | ½ | „ |
| Seeds of cardamom major | 1½ | „ |
| Seeds of cardamom minor | 1½ | „ |
| Cloves | 1½ | „ |
| Dry rose petal | ½ | „ |
| Chua | 1 | „ |
| Camphor | 1½ | „ |

Take all the ingredients except the last two and soak them in good rose water for 12 hours. Then bray them together to a paste form and incorporate chua and camphor.

## 'HER DYEING

77 C.P., Gudivada—Desires to know the ... of dyeing leather.

... is cheaply dyed with water dyes ... dyes. In the case of water dyes the ... is dissolved in boiling water and is ... to the leather with a medium soft brush.

BLACK

| | | |
|---|---|---|
| ... water | 1 | gallon. |
| ...stic soda | ½ | oz. |
| ...sine | 12 | „ |
| ... yellow | 12 | „ |

TAN

| | | |
|---|---|---|
| ... water | 1 | gallon. |
| ... soda | ½ | oz. |
| ... brown | ½ | lb. |

... dyes are prepared chiefly from ... spirit, acetone, turpentine and white ... mixtures of these.

BLACK

| | | |
|---|---|---|
| ...lated spirit | 1 | gallon. |
| ... | 1 | „ |
| ... black | 12 | oz. |
| ... oil | 4 | „ |
| ... grass oil | 4 | „ |

...

COLOURED

| | | |
|---|---|---|
| ... spirit | 1 | gallon. |
| ...ral oil | 1 | pint. |
| ... (coloured), oil soluble | 6 | oz. |
| ... of mirbane | 2 | „ |

... Apply with a soft brush.

## 'RINTING

... S.I.S.M., Madras—Desires to know a ... of printing tin plate.

... modern method of printing upon tinn... is an application of offset printing. ... machines may belong to either the ... the rotary type, but they are built ... special purpose and have their own ... The tinned plate, does not ... in contact with the printing sur... as it is carried round with the cylinder ... it is fed, it receives an offset impres... rubber blanket fixed upon a second ... which has already taken a direct print ... printing surface. As the plates are ... are arranged in racks and kept ... or they may be put into a stone for ...ing.

... printing each plate should be ... rubbed on both sides with a duster ... dirt, grease, etc., which may per... have got upon it, and which, if left, ...event the ink from printing. Rough ... also be smoothed, as otherwise the ...anket would soon be damaged.

...ethod adopted is the same as that of ...aper. The white would be done first, ... cover up all parts except those re... appear as gold and silver, or any parts ... a colour is required to appear with a Of course, only transparent yellow ... is usually printed after the white: it produces a nice strong buff where it falls upon the white, and a bright gold where it comes upon the bare tin. It may, however, be had of various shades to suit special requirements. It helps to give depth of colour and billiancy to solid reds and other colours. It is an important matter for the artist when drawing the design to take full advantage of the light colours. The black printing would come next, followed by the red and blue. After the work has dried, the plates are varnished and then stoved, after which they are ready for the tin box workers.

As with ordinary offset printing the rubber blanket will require to be washed several times during the day. This should be done with a very volatile liquid such as solvent naphtha spirits of turpentine, or benzoline, and it should be immediately afterwards dusted over with fine flour of sulphur. This treatment will impart to the rubber a fine printing surface.

All designs to be printed on tin should be specially lithographed by an artist with experience of tin plate work. Type matter must be reversed.

## DEODORISING KEROSENE OIL

247 G.L., Srinagar—Wants to know a process of deodorising kerosene oil.

| | | |
|---|---|---|
| Kerosene oil | 1 | gallon. |
| Chloride of lime | 3 | oz. |
| Slaked lime | 3 | „ |
| Hcl | | q. s. |

Mix the chloride of lime with the oil, and add Hcl until chlorine gas leaves to be given off, mixing thoroughly. Then pour on to the slaked lime, contained in another vessel, and allow it to remain a couple of days. Then well mix up. Allow the lime to subside, and draw off the petroleum.

## COCOA BUTTER SUBSTITUTE

192 A.M.F., Gohi—Wants a formula of cocoa butter substitute.

| | | |
|---|---|---|
| Lanolin | 6 | parts. |
| Spermaceti | 3 | „ |
| Olive oil | 1 | part. |

Mix the ingredients over slow fire. Then set aside to cool.

## COLOURING CELLULOID SHEETS

267 H.N.B., Ahmedabad—Wishes to have recipes of colouring celluloid sheets.

Thin celluloid sheets can be stained superficially, on one side or both sides, by dipping them in a bath of coaltar dye, prepared by pour-

ing an alcoholic solution of the coal-tar dye into a bath of 99 per cent. spirit containing a small amount of shellac and sandarac, or some other resin. This bath is acidified with boric acid, and shortly before use a little ether is added. to accelerate the drying of the coloured layer on the surface of the celluloid.

*The celluloid sheets* are immersed for a short time merely, this being sufficient to mordant and colour the surface. The coloured layer dries very quickly. If only one side of the sheet is to be stained, the other is first coated with asphaltum in the usual manner.

### CRACKERS

278 N.S., Shiyali—Wants to have a recipe of crackers.

| | | |
|---|---|---|
| Saltpetre | 45 | parts. |
| Sulphur | 18 | " |
| Charcoal | 25 | " |
| Potassium chlorate | 8 | " |
| Fine sand | 4 | " |

Mix very cautiously and skilfully; fill tissue paper tubes.

### MERCERISING COTTON THREAD

817 B.C., Kalyan—Desires to know a process of mercerising cotton thead.

Mercerising of cotton consists in impregnating the fibres with concentrated caustic soda lye, either with or without the application of tension, and in stretching material before and during the removal of the soda by means of washing. Mercerisation of cotton can be carried out either in the loose state or in the woven condition. Boiling out is of course the first step, although in occasional instances, when dealing with certain qualities of cloth, it is not resorted to. Hanks are boiled out under low pressure, while air passed through a boiling cut machine. Both forms of yarn are occasionally dried up after washing, before being brought into contact with the mercerising liquor.

The principles involved in the control of the mercerising bath are the same for both yarns and cloths. They depend upon the temperature of the bath as well as upon its degree of concentration, and also upon the state of the material wet or dry. When employed at a strength from about 22°Tw. to 56°Tw., and used regularly and continuously at the same strength, the temperature of the bath should not be allowed to exceed 30°C. At low temperatures the strength may be relatively decreased within certain limits. Generally considered, the duration of contact of the alkali with cotton is regarded only as a matter of s... dary importance, excepting in certain sys... of treating pieces, when the contact is al... to continue for many hours. For most p... a treatment extending over two to five ... is considered sufficient to give the maxi... results.

After treatment with caustic soda t... washing is an operation as important as and should be accomplished while the ... is still under tension. After this sou... washing follow, especially if the goods a... finished and are required for dyeing w... other colours than the substantive and ... dyestuffs.

After washing, the cotton is dried ... the stretched condition, mercerised yar... an appreciably better lustre than whe... in the loose state. A course of string... specially constructed machines is also o... ally resorted to.

### GLAZED THREAD

Bring 5 gallons of soft water t... 100°F. Then add 1·5 pound of potat... which has previously been dissolved in water. After thoroughly mixing, add 1... hard paraffin and 3.2 ounces coconut oi... all is dissolved, empty into clear pails ... when cold. Keep the tension of the ... the machine as much as possible. T... help to get a good, soft, brilliant lustre too much tension the thread will be wi...

### GENERAL SOLDERING FLUX

331 G.S.A., Deheri—Wishes to k... mulas of soldering flux, gold sold... solder, etc.

SILVER SOLDER

| | |
|---|---|
| Silver | 40 |
| Copper | 15 |
| Zinc | 20 |
| Cadmium | 18 |
| Tin | 1 |
| Lead | 1 |

Fuse in a fireclay crucible. Then ... oiled moulds to have thin sheets.

GOLD SOLDER

| | |
|---|---|
| Gold | 25 |
| Palladium | 2 |
| Copper | 5 |
| Cadmium | 3 |
| Silver | 4 |
| Zinc | 1/10 |

### Brass Solder

| | |
|---|---|
| Zinc | 49 parts. |
| Copper | 44 " |
| Tin | 4 " |
| Lead | 2 " |

### CK DRAWING INK

...53 R.V.S., Pindivaram Taluq—Desires to ... a good recipe of black drawing ink.

| | |
|---|---|
| ...ax | 3 lbs. |
| ...ched shellac | 4 " |
| ...n black | 2½ " |
| ...illed water | 50 " |

...lve the borax in the distilled water and ... to it the bleached shellac. Keep ... a day or until the solution becomes ... strain through a fine cloth. Lastly ... the carbon black in a part of this ... solution and thin the smooth concen... ...th the balance of it. Add some pre... ...like boric or salicylic acid 1/10 per

### ...ER COLOUR CAKES

... water colours may be prepared by ... the respective pigments, previously ... in powder, into a smooth paste with ... weights of isinglass size and thin gum ... paste is then compressed into ... as tightly as posssible and dried with ... gentle heat. Old crumbling cake colours ... powered very finely in a mortar, ... through fine muslin and ground up as ... gum water being omitted. The ... rubbed up with honey to the consist... ...cream, constitute moist colours.

### ...W

... R.I.P., Ahmednagar—Wants to have ... formula of preparing snow, and also ... ...pals.

| | | |
|---|---|---|
| ...ic acid, triple pressed | 200 | parts. |
| ...tic potash, sticks | 14 | " |
| ...ter | 750 | " |
| ...rine | 50 | " |
| ...t. spirit | 100 | " |
| ...mot oil | 4 | " |
| ...der | 2 | " |
| ...ylang oil | 1 | part. |
| ...oil | 1 | " |
| ...ranium oil | 5 | parts. |

...ve the caustic potash in one third ... the water. Dissolve the glycerine in ... ...ning portion of the water. Now put ... acid in a porcelain or enamelled vessel ... bath and also put the caustic solu... ... the remaining water in another two ... vessels placed over the water bath ... to 80°C.

... the contents of all the three vessels ... to about 80°C. the caustic potash ... slowly stirred in the melted stearic ... vigorously for a few minutes and ...vly add the water. Remove the vessel ... water bath to cool but continue stir... ...til the mass is nearly solidified. Now ...tial oils in the spirit and add this to ...ified mass. Cover and set aside, stir ...onally. In about two weeks the silvery ...als begin to form.

### KASTURI PILLS

| | |
|---|---|
| Cardamom | 10 oz. |
| Cloves | 10 " |
| Cinnamon | 10 " |
| Nutmeg | 10 " |
| Mace | 10 " |
| Cubeb | 10 " |
| Catechu | 10 " |
| Camphor | 1 " |
| Musk | 1/10 " |

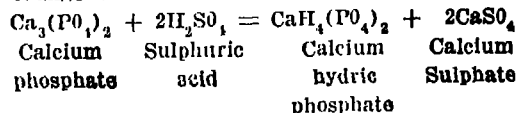
Take the ingredients in fine powder and thoroughly mix. Put the whole in a mortar and make it a stiff paste by adding rose water. Bray well for some time. Take this and make it into small pills of 2-3 grains each and dry it in shade.

### PHOSPHORUS

390 R.C.P., Dindori—Desires to know a process of making phosphorus.

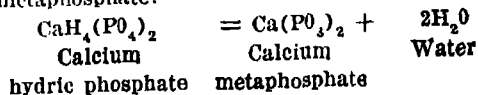
The first step in the preparation of phosphorus is to mix bone-ash with two-thirds of its weight of sulphuric acid diluted with water. Calcium phosphate is insoluble, but under this treatment is transformed into a soluble acid phosphate, commonly known as superphosphate of lime. The following equation represents the change which occurs:—

$$Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$$

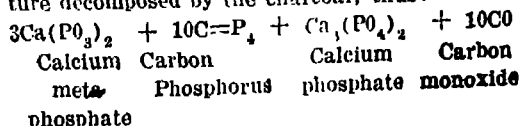
Calcium phosphate — Sulphuric acid — Calcium hydric phosphate — Calcium Sulphate

The calcium sulphate is allowed to settle, and then the clear solution of acid phosphate is evaporated down to the consistency of a syrup and mixed into a paste with powdered charcoal. This is dried and then heated to low redness in an earthenware retort, the stem of which dips under water.

The first result of the application of heat is that the acid or hydric phosphate loses its water, being converted into a salt known as the metaphosphate:—

$$CaH_4(PO_4)_2 = Ca(PO_3)_2 + 2H_2O$$

Calcium hydric phosphate — Calcium metaphosphate — Water

The metaphosphate is at the high temperature decomposed by the charcoal; thus:—

$$3Ca(PO_3)_2 + 10C = P_4 + Ca_3(PO_4)_2 + 10CO$$

Calcium metaphosphate — Carbon — Phosphorus — Calcium phosphate — Carbon monoxide

The phosphorus thus produced distils over, and is purified by re-distillation and squeezing through wash-leather under warm water.

[Reader's business problems will be discussed in these pages. We invite the reader to ... his difficulties. As the department is in charge of an experienced businessman ... specially adept in dealing with such problems and to whom experiences of a large ... of successful businessmen are available, his replies will lead the enquirer to a ... career. These replies will be published in the paper only and cannot be communic... post.]

**LIMITED LIABILITY COMPANIES**

375 B.B.C., Agra—Wants to be enlightened on the particulars of limited liability companies.

Limited liability companies are divided into (a) private companies and (b) public companies. A private company can be registered by two or more persons if by its articles it (1) restricts the right to transfer its shares; (2) limits the number of its members to fifty; and prohibits and appeals to the public at large to take up shares or debentures. This has had a prejudical effect upon the Limited Partnership Act, as by registering a business as a private company the partners then all have liability limited. A public limited company must consist of at least seven members. To come into being a Memorandum of Association must be registered which defines the nature and scope of its business. This memorandum must state (1) the name of the company—with the word "Limited" attached (2) the country where the registered office is situated; (3) the objects of the company; (4) that the liability of the members is limited; (5) the amount of share capital and the division thereof into shares of a fixed amount. This memorandum must be signed by the subscribers and it is provided that (1) no subscriber to the Memorandum may take less than one share; (2) that each subscriber writes opposite to his name the number of shares he takes.

With the Memorandum of Association may be lodged (1) the Articles of Association i.e., the rules and regulations for the management of the company; (2) a list of the directors with their written consent to act; (3) a contract by any director to pay for his qualifying shares and (4) a statutory declaration by the secretary, a director or solicitor employed in the promotion, that all the requirement of registration have been complied with.

**PROSPECTS OF AN INSURANCE AGENTS**

423 P.K.S., Jubbulpore—Writes, "Will you please discuss in the columns of your esteemed journal the prospects and requirements of an insurance agent"?

That the insurance business is expanding day by day and holds out great possibilities is common knowledge. The insurance companies transact a huge amount of business ... and insurance agents have extra... chances of earning fat dividends by ... and intelligent work. The occupation of insurance agent is both lucrative and ... able. The profits that successful men in ... make are quite decent and should attract ... youngmen more and more. But the ca... supposes zeal for work, able canvassi... city and capable salesmanship. Th... sometimes seems tiresome and the fi... months are the most trying period in ... history of an insurance agent. Disappo... are met with more often than progres... times become heart breaking.

A prospective insurance agent sh... fore trying for an agency master the ... ties of the insurance business and shou... it a point to acquire a fairly good know... the general business of insurance, ... what facilities this business offer to ... pective customers.

On appointment the first duty of ... should be to study the prospectus and ... literatures of the company as if they ... amination papers and discuss them b... till he is familiar with all its ins. and ... is thoroughly acquainted with its stron...

Acquaint yourself as thoroughly ... full history of the company and its wo... possible. A knowledge of the affairs ... companies working in the same line ... covetable as this enables the agent to ... on solid grounds when the names of ... companies crop up. The aim of an ag... make a name by tactful ability and ... service. He should be in a position to ... why he is convinced that the methods ... of his company have advantages over ... his rivals. On the forceful and co... talk on this point depends the succes... agent not to a little extent. He sh... aware of all the alloys in the local i... affairs and by dint of his knowledge ... institutions should be able to show ... policy and general conditions of our ... are in some respects not so good ... customer as that of the agent's company ... in other respects they are less advan...

# —BRIEF QUERIES AND

...ons of any kind within the scope of Industry are invited. Enquiries or replies from our ... will be published free of charge in serial order. Questions are replied by post on receipt ... stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

... P.D.M., Shamby—I appreciate your ... You should devote more time and ... in flour mill, rice mill and oil mill. ...prehend competition from other sugar ...turers may hamper your business, ...ould stop manufacturing sugar for ...ent. But if this also does not suit you ...ure sugar and stock it for selling ... the time of scarcity. Over and above ... should try to eliminate hand labour as ... you can.

... S.V.S., Lucknow—For machines ... you such as wood screw making, ...ssories making etc. enquire of Alfred ... (India) Ltd., 13/3, Strand Road; ...Klein & Co. Ltd., 1, Royal Exchange ... T. E. Thomson & Co. Ltd., 9A, ... East; all of Calcutta.

... N.C.C., Coimbatore—For spinning ... write to Oriental Machinery Supplying ... Ltd, P12, Mission Row Extension, ... and W. H. Brady & Co. Ltd., Church ... Fort, Bombay.

... B.L.S., Patharia—You may consult ... Market of India, 40, Tadwadi, China ... Bombay. You have to prepare thin ... sticks for agarbati from bamboos. We ... book on paint and distemper manufac... ...may enquire of Thacker Spink & Co. ... Ltd., 3, Esplanade East, Calcutta for the ...quired.

... R.S.M., Shimoga—For water bags ... Bengal Waterproof Works (1940) ... Theatre Road, Calcutta.

... H.V, Bangalore—Process of manufac... ...phor appeared in May 1950 issue of ...

... J.K., Travancore—For hops write to ... & Co., 37, Grant Street, Calcutta and ... Stores, 2, Bertram Street, Calcutta.

... H.M.G., New Delhi—You may take ...ture of hair pins and clips on a ... and expand the business accord... ...and. Shoe lace making may also ... on a small scale. You may also ... manufacture with Rs. 5,000.

... Ollur—For required pencil write ...ptoo. 12, Beleghata Main Road, Cal... ... C. Law & Co., 2, Cornwallis Street, ...

... S, Amroha—There is no arrange... ...ving training on plastic industry ... shoe making. For machines you ... of Francis Klein & Co., Ltd., 1, ...change Place and Alfred Herbert ... Ltd., 13-3, Strand Road; both of Cal...

... C., Howrah—An article on cottage in... ...appeared in December 1950 issue of Industry.

507 B.D.D., Etawah—For press machine enquire of Alfred Herbert (India), Ltd., 13-3, Strand Road and Francis Klein & Co., Ltd., 1, Royal Exchange Place; both of Calcutta.

508 S.I.Q., Madras—Process of manufacturing vinegar will be found in Home Industries published from this office, price Rs. 3/9/- including postage.

509 R.U., Nigeria—You may deal in indigenous herbs and drugs also in manufactured goods such as sporting goods, textile jute manufactures, rubber goods, etc. But you will not be able to do business on commission basis. You have to buy the goods outright. Address of Indian goods manufacturers will be found in Industry Year Book and Directory published from this office, price £1-6Sh.

510 F.C.I., Rawalpindi—Advertising tape may be had of Eagle Advertising Tape Factory, 51, Eaglewadi, Kurla, Bombay.

511 V.P.D.S., Masulipatam—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta.

512 P.C.G., Allahabad—You may start import and export business. This business may be started on a small scale and can be expanded as you like. As regards cloth and cycle business you may also import these articles from foreign countries when your business will fall under general import business. Scope of textile and cycle business is limited while the scope of import business is unlimited. You may import from a smallest needle to an automobile or an aeroplane. So it is advisable for you to start import and export business.

513 J.P.J., Rikhikesh—If you go through April 1951 issue of Industry which deals with an exhaustive article on Indian Soil and Crops you will get all the informations your require.

514 E.I.G.C., Bombay—We have no book on carbon paper manufacture. Process of manufacturing carbon paper appeared in March 1951 issue of Industry. For machine enquire of Jessop & Co. Ltd., 93, Netaji Subhas Road, Calcutta.

515 U.C.C., Kanpur—Pin making machines may be had of Baird Machinery Co., Bridgeport, Connectieut, U.S.A. Process of gloy making will be found in April 1950 issue of Industry.

.., Delhi—Radio parts may be had of C. ... Ltd., 170, Dharamtala Street; Philips Electrical Co. (India) Ltd., 2, Heysham Road; L. C. Saha Ltd., 20D, Lindsay Street and Nalini Radio & Electric Corporation, 5, Lindsay Street; all of Calcutta.

517 V.C.B.P., Jamnagar—For bandage making machines enquire of W. H. Brady & Co. Ltd., Mercantile Bldgs., Lall Bazar, Calcutta.

518 T.N.S., Bhimavaram—Bottles may be had of The Krishna Silicate & Glass Works Ltd., 17, Radha Bazar Street; Imperial Glass Works, 9, Ezra Street; Victoria Glass Works, 130, Mechuabazar St.; Oriental Glass Works, 58, Bahir Sura Road, and New Cherry Glass Works, 137-15, Narkeldanga Main Road; all of Calcutta. An exhaustive list of glass bottle manufacturers will be found in Industry Year Book & Directory published from this office, price Rs. 16/4/- including postage.

519 N.V.D., Madras—Process of manufacturing benzoin appeared in February 1951 issue of Industry.

520 B.P.W., Patiala—Groundnut oil is treated with 10 per cent of its weight of fuller's earth, which should be dehydrated by roasting prior to use. Mix thoroughly and then heat the mixture to 100°F and maintain the temperature constant for 15 minutes. Lastly filter the oil through filter press. Thus a clear oil is obtained but the odour of the oil is somewhat earthy. To remove this bad odour wash the oil with 1 per cent solution of brine containing on equal amount of dry sodium carbonate. You have to extract juice from bhringaraj. Shellac wax and bhringaraj may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

521 S.G., Lucknow—You may consult Talbot & Co., Tower House, Chowringhee Square, Calcutta.

522 R.A., Raipur—Envelop and cardboard box making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta and John Dickinson & Co., 6, Clive Row, Calcutta.

523 H.T.S., Garobadha Hath—Refer your query to the Secretary, Royal Calcutta Turf Club, 11, Russel Street, Calcutta.

525 P.L.M., Jodhpur—For graphite enquire of Bengal Supply Co., 23-24, Strand Road, Calcutta; Modern Traders Ltd., 22, Canning Street and Keymer Bagshawe & Co., Ltd., 22, Strand Road; all of Calcutta.

526 S.N., Kalimpong—We have no book on beeswax bleaching. Process of beeswax bleaching appeared in March 1951 issue of Industry.

527 S.K.V., Lucknow—It is not possible to recharge exhausted dry cells.

530 V.A.C., Madurai—For addresses of Belgium you may negotiate with Consul General for Belgium, 24/1A, Alipore Road, Calcutta ... may also negotiate with the Consulate ... for China, 30, Stephen Court, 18B, Park ... Calcutta.

531 S.B., Jullundur City—We a... aware of the full address of New Huma...

532 B.B.T., Agra—For steel wire ... of Balmer Lawrie & Co. Ltd., 21, Netaji ... Road; Calcutta Steel and Wire Age... Clive Row; Paul Brothers, 115, Netaji Road and Standard Metal Co., 77-1, Netaji Rd.; all of Calcutta.

534 C.A.C., Chelakara—Process of ... facturing denatured spirit will appear ... course.

535 S.I.C., Jaunpur—For ice cand... machine enquire of Refrigeration & Air... tioning Industries Ltd., 34, Ezra Street; ... rators (India) Ltd., 59C, Park Street ... Ice & Refrigerators Ltd., 5, Royal E... Place; all of Calcutta. For thermoflask ... of the following firms: Dutt & Co. ... Old China Bazar Street and Bepin Beha... 495, Old China Bazar Street; both of C...

537 R.K.G., Dhampur—Formulas ... paint and glass ink will appear in due ...

538 A.C.B., Palamau—Following is ... of soorki mills: Ananda Soorkey Mil... Galiff Street; Behar Surkey Mill, 2, Lim... Calcutta Soorkey Mill, 22A, Canal West ... Durgapore Surkey Mills, 73, Mahesh Du... and Kamala Soorkey Mill, 153, Galiff St... of Calcutta. Following is a list of rollin... India Rolling Mills Ltd., Stephen H... Dalhousie Square, Calcutta; Eyre Smel... Ltd., Hide Road, Kidderpur, Calcutta an... Durga Rolling Mills, 197-1, G. T. Road, ... Howrah.

539 H.A H.C., Jubbulpore—Powde... balans are used in tanning leather. P... hide may be utilised in making glue.

542 H.J.S., Bombay—Further par... regarding new sulphuric acid plant ... available. It is still in experimental st... has not been put on commercial scale.

544 S.C., Marakankadawala—For ... fittings enquire of the following firm... Bose & Co., 184, Chandney Chowk and ... Hardware Stores, 155-156, Chandney ... both of Calcutta.

545 B.R.T., Bikaner—Your enqui... ed in March 1951 issue of Industry und... Enquiry Columns so it cannot be repea... better put an advertisement in Classi... gaia pages of Industry.

546 M.K.K., Mangalore—Process of ... turing benzoin appeared in March 1951 ... Industry.

517 R.L.K., Davangere—Process of manufacturing artificial slate appeared in April 1951 issue of Industry.

H.C.P., Patna—Process of manufacturing ... goods will be found in Manufacture of Goods published from this office, price ... including postage. Process of manufacturing snow cream will appear in due course.

S.R.C., Bombay—The article sent by you is unsuitable to be published in Industry by Editorial Board.

M.A.K., Bombay—Following is a list of ... cards manufacturers: S. A. Leonard ..., 13-1A, Govt. Place East, Calcutta; Playing Card & Carton Manufacturing ..., Lashkar, Gwalior; Oswal Playing Card ..., Sadar Bazar, Delhi and United Playing Card Co., 81, Chuckla Street, Bombay 3.

P.K.M., Travancore—Process of manufacturing rose water will appear in due course.

K.S.M., Lahore—We cannot help you in the special kind of wax without seeing ...

S.B.P., Ganjam—Tannic acid and gallic ... be had of Calcutta Chemical Co., Ltd., ... Lane; Banshidhar Dutt, 126, Khengrapatti Street and Fuzlehussein & Bros., 41, ... Street; all of Calcutta.

A.P., Ganjam—Perfumery raw materials may be had of Paradise Perfumery House, ... Street; Essence Supply Agency, 6, ... Street, Calcutta, B. C. Patel & Co., 143, ... Street, Bombay; F. N. Sirkar, 37, Canning Street, Calcutta and Perfumery Ingredients ..., Mangaldas Road Market, Bombay.

A.C.B., Jodhpur—Process of manufacturing naphthalene balls and rubber baloons ... in due course.

... P.C., Neemuch—For tea enquire of ... following firms: Bharat Tea Estate Factory, ..., Jalpaiguri; Bharnabari Tea Estate ..., Hasimara, Jalpaiguri; Rhoni Tea Factory, Kurseong, Darjeeling and ... Tea Estate, Tung, Darjeeling.

G.R.S., Goraya—To fasten rubber to ... use a cement by macerating virgin ... as pure rubber as can be had, cut in ..., in just enough naphtha or galsoline to cover it. Let it stand in a very tightly sealed jar 14 days, or a sufficient time ... dissolved, shaking the mixture daily.

P.K.N., Madras—For sarees enquire ... & Co., 61-5, New Market and L. H. ... Co. Ltd., 10, Park Street; both of ...

B.B.T., Agra—For transfer pictures enquire of the following firms: Mukharji & Sons, 14, Badur Bagan Street; R. G. Paul & Co., 110/2, Grey Street; Signograph Co., 208, Gopal Lal Thakur Road and Union Investors, 32B, Chandra Chatterjee Street; all of Calcutta.

570 M.S.B., *Ludhiana*—Process of manufacturing pencil will be found in Industry Prize Article Vol. 1, Price Rs. 2/- including postage.

571 T.S.L.H., Cachar—For selling pineapples you may negotiate with the following fruit dealers; Dulichand Kisholal, 146, Cotton Street; Gokul Chand & Co., 18, Bal Mukunda Mukkar Road and Gopilal Tulsiram, 68, Cotton Street; all of Calcutta.

572 M.P.P.C., Bhilwara—For candle making machines and moulds enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension; both of Calcutta.

573 E.C.F.I., Ambala Cantt.—There is no arrangement for giving practical training in ultramarine. A good formula of ultramarine blue appeared in September, 1950 issue of Industry.

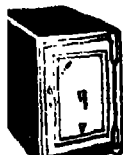
575 P.N.D., Agartala—For nut and bolt making machine enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta. Particulars of the machine will be supplied by the machine suppliers.

578 N.D., Jamnagar—For umbrella fittings you may write to Containers (India) Ltd., 11-2, Old China Bazar Street; Gambhir Chand Rathi, 39, Armenian Street and Sohanlal Mohanlal Ltd., 5, Lucas Lane, all of Calcutta.

580 G.M.C., New Delhi—For making wire of copper you should use wire drawing machine which may be had of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta; Jessop & Co. Ltd., 93, Netaji Subhas Road, Calcutta and Mather & Platt Ltd., Bruce Street, Fort, Bombay. Process of enamelling copper appeared in January 1950 issue of Industry.

581 S.B.M.I., Aligarh—You may communicate with the querist with the number and initials care of Industry when your letters will be redirected.

582 G.D.S.C., Kanauj—Process of manufacturing liquid and solid disinfectant appeared in April 1950 issue of Industry.

583 S.F., Gorakhpur—All the machines you require may be had of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta; Dr. Bose's Laboratories Ltd., 45, Amherst Street, Calcutta and Prabartak Commercial Corporation, 61, Bowbazar Street, Calcutta.

584 R.S.S., Purnea—You may negotiate with the following glass works: Balsukh Glass Works, 7, Swallow Lane; Burma Glass Works, 9, Ezra Street; Glass Products Ltd., 56, Belgachia Road; Hind Glass Works, 35, Chittaranjan Avenue; Jayanti Glass Works Ltd., 8, Ezra Street and Victoria Glass Works, 130, Mechuabazar Street; all of Calcutta. Packing paper may be had of Bharat Paper Syndicate, 1-2, Jackson Lane and Bholanath Paper House Ltd., 32A, Brabourne Road; both of Calcutta. Following is a list of industrial and commercial journal: Indian Textile Journal, Surya Mahal, Military Square, Fort, Bombay; Commerce, Royal Insurance Bldg., Churchgate Street, Fort, Bombay; Arthik Bharat, 3, Commercial Bldg., 23, Netaji Subhas Road; Arthik Jagat, 122, Bow Bazar Street; Calcutta Exchange Gazette, 5, Mission Row and Capital, 4, Lyons Range; last four of Calcutta.

587 S.A.N.K., Darbhanga—Process of manufacturing extra-strong peppermint lozenge will appear in due course.

588 A.P.J., Rohtak—For selling calcine you may negotiate with Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane and Indian Mineral Industries Ltd., 22A, Dum Dum Road, both of Calcutta.

595 D.R.N.S., Bangalore City—Betelnut shall be cut in small pieces then put in grinding machine for powdering.

597 S.I.B., Amraoti—We have no book on ushan grass cultivation. For agricultural book write to Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3, Old Court House Street, Calcutta.

603 T.S., Nandyal—Following is the process of manufacturing rose otto on small scale: Procure rose petals of one colour and layout ½ inch thick, in a vessel. Cover them with a clean piece of rag moistened with sandal oil and folded 4 times. The cloth should be thoroughly wetted by rasping. Layout over the rag on other lot of petals. Then close up the mouth of the vessel and place in the sun for 15 days. Finally press out the otto. Store in a stoppered phial and place in the sun for a month to clarify. Jasmine otto may be prepared by this process.

608 R.B., Madras—Rubber stamp making implements may be had of Rubber Sceven & Co., 156, Cornwallis Street, Calcutta.



609 M.A.B., Jodhpur—For essence o[f] enquire of Paradise Perfumery House, 7, [...]tola Street, Process of manufacturing n[a...]lene balls will be found in Manufac[ture of] Disinfectants & Antiseptics published fro[m this] office, Price Rs. 3-8- including postage. [Process] of manufacturing rubber baloons will b[e found] in Manufacture of Rubber Goods publish[ed from] this office, price Rs. 3-8 including postag[e].

610 H.S.A., Meerut—For razor enq[uire] the following firms: Esmail Yar M[...] Bros., 22, Cutlery Bazar, Bomay; Madan [...] Sadar Bazar, Meerut and Diamond Sciss[ors] Outside Kamboo Gate, Meerut City.

612 P.K.K.P., Quilon—Process of [manu]facturing candles appeared in April 19[5] of Industry.

613 A.D.H., Marak—We are not [...] whether life belts are stuffed with Ka[...] Semul Cotton. No life belts are made of [...] rubber tubes.

615 U.W.M., Pyu—Oil extracting a[nd cen]trifugal sugar making machine may be [had of] Oriental Machinery Supplying Agency, P12, Mission Row Extension, Calcutta.

614 S.S.P., Siwan—Thermometer [...] hydrometer may be had of Adair Dutt [...] Ltd., Stephen House, Dalhousie Square, C[a...] and India Scientific Stores, 14-2, Old [...] Bazar Street, Calcutta.

619 B.S.P., Hoshiarpur—Process [of re]covering silver from waste film will [...] in due course.

624 H.N.K., Delhi—Process of m[anufac]turing all kinds of ink will be found i[n ...] 1950 issue of Industry. You may also [...] Manufacture of Ink published from thi[s ...] price Rs. 3-8 including postage.

625 S.D., Calcutta—Process of m[anufac]turing aluminium flouride will appear [in due] course.

626 T.B.F., Indore—All kinds of [...] you require may be had of Calcutta C[...] Co. Ltd., 10, Bonfield Lane, and Banshidh[a...] 126, Khengrapatty Street; both of Calcut[ta].

627 K.S., Markapur—Process of [...] lantern sildes will appear in due cours[e].

631 B.R.T., Ratan Nagar—Sanskr[it equi]valent of Coptis Teeta is mishamilita. In [...] it is known as golden thread root. It i[s ...] in the Mishmi mountains of east of [...] Imported into Bengal. Dried root is [...] a medicine. It contains neither tann[ic ...] gallic acid but abounds in a compoun[d ...] yellow bitter principle berberine solu[ble in] water and in alcohol. It is febrifuge. [...] tonic it increases appetite, restores di[gestive] power and removes flatulence and [...] obstructions. It is said to be useful in [...] as well as in debility, convalescence aft[er ...] and other debilating diseases, atonic dy[spepsia] and in mild forms of intermittent fev[er ...] catarrhal and rhematic conjunctivitis, th[e ...] made into a paste with Rosavanti is [...] a collyrium for the eyes.

637 A.L.B., New Delhi—Santonin is [...] as ship, kirmala, kirmari-owa, etc. It is [...] variable plant found in the Western Hi[malayas] from Kashmir to Kumaon. Wormseed m[ay be] had of Indian Herb Store, 31, Mullick [...]

nd Banshidhar Dutt, 126, Khengrapatty Street: ...th of Calcutta.

6.. K.V.N., Jaysingpur—Process of ma... ...ing chalk sticks will be found in ... ...ive Industries, published from this ... ...ice Rs. 3-8- including postage.

... D.G.P., Saugor—Following is a list ... ...h factories: Western India Match Co. ... ...ambazar, Near Calcutta; Calcutta ... ...dustrial Works, 14-22, Canal East Rd., ... Match Factory, 16, Dum Dum Road. ... ...m, 24 Pargs.; Kankaria Match Factory, ... ...nkaria Tank, Ahmedabad and Amrit ... ...ctory, Kargi Road, Bilaspur.

... A.T.C., Sakchi—For graphite crush... ...ines enquire of Jessop & Co. Ltd., 93, ... ...bhas Road and Marshall Sons & Co. ... Netaji Subhas Road; both of Calcutta. ... no book on minerals. You may how... ...ire of Thacker Spink & Co. (1933) ... ...splanade East and W. Newman & Co. ... Old Court House Street; both of ...

... M.S., Nazareth—Process of manufac... ...ffee tablets will appear in due course. ... making machine enquire of Small ... Mfg. Co., 22, R. G. Kar Road; ... Machinery Supplying Agency Ltd., ... ...ion Row Extension and Prabartak ... ...al Corporation Ltd., 61, Bowbazar ... ...ll of Calcutta.

... Y.B.S., Katmandu—For religious ... Hindi enquire of the following firms: ... ...nat Book Depot, 195-1, Harrison Rd., ... ...rary, Barnagore and Sri Aurobindo ... ...dir, 15, College Square; all of Calcutta.

... C.M., Bombay—Process of manufac... ...tion, nylon, etc. and crystal plastic ... in due course.

... M.G.S., Madras—Soap making machin... ...ad of Small Machineries Mfg. Co., ... Kar Road and Oriental Machinery ... Agency Ltd., P12, Mission Row Ex... both of Calcutta. Raw materials for ... may be had of Calcutta Mineral ... Ltd., 31, Jackson Lane, Calcutta.

... C.C., Faridabad—For industrial ... ...ure of the following firms: Thacker ... (1933) Ltd., 3, Esplanade East; ... & Co. Ltd., 3 & 4, Old Court House ... Standard Literature Co. Ltd., 13-1, ... House Street; all of Calcutta.

... R.M.S., Karachi—For automobile ... parts enquire of the following firms: ...tomobiles, Opera Tram Terminus, ... Howrah Motor Co. Ltd., Mission ...ow, Calcutta and Jyoti Motor Stores, ... 8994, Calcutta.

666 S.B.H., Indore—For pin, tag and envelope making machines write to Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. The firm will supply you particulars regarding starting factories with their machines.

667 C.C.P., Surat—Tallow may be had of Indian Tallow Supply Co., 21, Tiretta Bazar Street and Calcutta Tallow Supplying Co., 19, Tiretta Bazar St.; both of Calcutta. For perfumes enquire of F. N. Sirkar, 37, Canning St., Calcutta and Ghose Bros., 50, Ezra St., Calcutta.

669 K.V.S., Mangalore—Process of manufacturing insulating tape appeared in August 1950 issue of Industry.

670 M.C., Calcutta—We have no directory of printing presses. A list of printing press will be found in Industry Year Book and Directory which you have already got.

671 S.P.C., Bombay—Process of stencilling will appear in due course.

673 S.V.Z.C., Lucknow—Please write in English.

677 M.Y.K., Muzaffarnagar—For electroplating chemicals enquire of Alfred Herbert (India) Ltd., 13-3, Strand Road and S. Mitra & Co., 30, Bentinck Street; both of Calcutta.

682 P.N.K., New Delhi—For waterproof enquire of the following firms: B. C. Nawn & Co., 7, Bow Bazar Street; Bengal Waterproof Works Ltd., 32, Theatre Road and Hari Ram & Co., 171, Harrison Road; all of Calcutta.

683 P.R., Calicut—Process of manufacturing snow cream and brilliantine will appear in due course. For registering trade mark you may negotiate with Dutt & Co., 82, Harrison Road, Calcutta.

685 S.R.R., Shencottah—Process of manufacturing attar and essences will be found in Indian Perfumes, Essences and Hair Oils, published from this office, price Rs. 3/9/- including postage.

686 P.C.B., Hazaribagh—Leather may be had of Anwar Leather Stores, P-15, Bentinck Street, Calcutta; Chinese Leather Syndicate Ltd., 2-1, Russell Street, Calcutta; A. V. Mohamed & Co., 247, Angappa Naick Street, Madras; Empire Leather Works, 1/35, Khaleel Mansions, Mint Road, Madras; Bombay Leather Stores, La Touche Road, Kanpur; Cawnpur Leather Industries, Meston Road, Kanpur and Jeewa Bhai Ismail, La Touche Road, Kanpur.

689 T.N.S., Kotah—It is not possible to start an oil mill with Rs. 100/- as capital. You may start biri manufacture with Rs. 100/-. Process of biri manufacture will be found in Indian Tobacco and Its Preparation published from this office, price Rs. 3/9/- including postage.

**690 P.N.M., Gajendragad—Photo frame cutting machine may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.**

691 A.P.J., Rohtak—Formulas of infants food, casein plastic etc., will appear in due course.

698 A.S.K., Rampur—You may consult books on glue manufacture and phosphorus manufacture which may be had of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

701 A.H.S., Madras—For books enquire of the following firms: W. & G. Foyle Ltd., 119-125, Charing Cross Road, London W. C. 2; Chapman & Hall Ltd., 37, Essex Street, Strand, London W. C. 2 and Sir Isaac Pitman & Sons, Ltd., 1, Amen Corner, London E. C.

702 P.C.C., Samastipur—Flat rice (Cheeras) is not manufactured in a machine. Dhenky is used for making flat rice.

703 A.A.C., Jamshedpur—For securing Central Drug Licence you have to apply to the Director, Central Drugs Laboratoy, Govt. of India, 110, Chittaranjan Avenue, Calcutta, who will supply you a form and other particulars. You should fill up the form and send it to the Director.

704 T.E.W., Darbhanga—Sulphur dioxide and methyl chloride gases are not manufactured in India.

705 J.P.S.L., Kanpur—Recipes of medicines you require will appear in due course.

713 O.I.C., Berhampur No such chemical which imparts glaze on confectionery is available.

715 M.S., Broach—All the chemicals you require may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Banshidhar Dutt, 126, Khengrapatty Street: both of Calcutta. Dyes may be had of Fuzle Hussein & Bros., 44, Armenian Street and Champalal Agarwala, 45, Armenian Street; both of Calcutta.

717 R.S.G., Raiganj—Isopropyl alcohol may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. Filter press may be had of Subol Dutt & Sons Ltd., 13, Brabourne Road, Calcutta. You may use any kind of otto for flavouring sindur.

718 C.S., Kharagpur—To communicate with any querist write him with number and initial care of Industry when your letter will be duly redirected.

719 B.M.S., Saharanpur—Following is a formula of brake oil: Castor oil, neutral 10 parts; alcohol 10 parts. Mix and use.

720 B.D.S., Patna—Dies for buttons may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

721 H.S., Budaun—For rope making machines write to Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

725 U.S.A., Meerut City—Process of gilding will be found in Electroplating In Practice published from this office, price Rs. 3/9/- including postage. For tempering box enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

727 S.D.S., Tadpatri—Boil wat[er] 212°F.

730 N.I.P.B., Kunnamkulam—To [...] beeswax cut it in thin flakes and put [...] sun for 4 or 5 hours when it will melt [...] ly; strain through linen.

731 N.B.C., Howrah—No machin[...] quired for manufacturing sugar candy. [...] pans for boiling sugar and iron po[...] perforated bottoms are required. After [...] the syrup it is poured in the pots a[...] pieces of sugar candy are hung in the [...] means of thread.

733 S.S., Calcutta—Process of [...] turing pencil will be found in Indust[...] Articles Vol. 1 published from this o[...] Rs. 2/- including postage. Machines [...] had of Oriental Machinery Supplying [...] Ltd., P12, Mission Row Extension, C[...]

736 T.N.B., Kanpur—For shellac [...] of the following firms: A. M. Aratho[...] 11, Stephen House, Dalhousie Square; [...] Bros. Ltd., 6, Lyons Range and T[...] Shellac Factory, Hathibari, Tollygunge[...] Calcutta. Moulding powder is not ma[...] ed in India at present.

737 D.V.S.B., Ludhiana—The ano[...] dation of aluminium produces a surfac[...] which is totally unlike the metal in [...] and possesses a rather remarkable [...] properties. When properly prepared it [...] coloured with a variety of organic d[...] pigments to produce attractive d[...] effects. Detailed process of anodic oxi[...] aluminium will be found in June, 19[...] of Industry.

739 U.T.A., Allahabad—Collapsib[...] may be had of Metal Box Co. of India [...] Hide Road, Kidderpur, Calcutta.

740 G.U., Madras—Process of ma[...] ing rubber baloons will appear in du[...] Process of manufacturing candles [...] tablets appeared in April 1950 issue of I[...]

741 A.P.W., Delhi—For rubbe[...] making appliances write to Rubber S[...] Co., 156, Cornwallis Street; V. D. Ag[...] Peary Das Lane and A. K. Bhar & [...] Bonfield Lane; all of Calcutta. For [...] machine write to R. B. Brett & Son, 3[...] Street, London E. C. 4 and Gordon [...] Ltd., 75-79, Farringdon Street, London [...] For paper write to T. B. Allman, 42, F[...] Street, Edinburgh 2 and Gray James [...] 16, Pilpot Lane, London E. C. 3.

743 S.C., Kumbakonam—We hav[...] ceived sample for Sambar powder. Fo[...] sambar powder you should advertise [...] papers.

744 C.M.H., Delhi—For tin chl[...] quire of Bengal Chemical & Pharm[...] Works Ltd., 94, Chittaranjan Avenue, C[...]

746 M.J.M.S., Changanacherry—F[...] minium cap enquire of the followin[...] Aluminium Corporation of India Ltd., [...] Subhas Road; Aluminium Manufactu[...] Ltd., 4, Fairlie Place and Jeewanlal (192[...]) 31, Netaji Subhas Road; all of Calcutta.

# —REVIEW OF BOOKS

**DYNAMIC EQUIPMENT POLICY by George Terborgh. Published by McGrawhill Book Company, Inc., New York. Pages 290.**

[illegible] is a lamentable lack of readiness on [illegible] of the Indian industrialists to re- [illegible] renovate their factories to keep [illegible] the modern standards of production [illegible] output. Their general attitude is to [illegible] with the old buildings and machineries [illegible] possible and to scrap a machine only [illegible] could no longer perfom the job, for [illegible] was originally designed or when the [illegible] charges on the machines outrun [illegible] term profits these equipments were [illegible] of yielding. It is quite possible [illegible] the life time of the installed [illegible] still going on, new types of equip- [illegible] fitted to do the jobs and more ec- [illegible] have been introduced in the market [illegible] as rivals to their organisations and [illegible] contribute to the reduction of their [illegible] profit. In the presence of improved [illegible] quality of their service may decline [illegible] to available alternatives even when [illegible] deteriorate absolutely. Only on [illegible] is the question asked whether a [illegible] can do the job better and more [illegible] than an existing one; or whether [illegible] layout involving, say, two new [illegible] instead of three installed, would do [illegible] economically still. It is thus time [illegible] become a bit more re-equip- [illegible] and study the advantages of a [illegible] policy of re-equipment to place their [illegible] on a thoroughly modern line.

[illegible] that the challenger is the best [illegible] machine of the time, it will also [illegible] operating inferiority at a constant [illegible] its service period and secondly, [illegible] challengers will have the same adverse [illegible] the present one. Because of these [illegible] no determinable relation between [illegible] and defender that by itself can [illegible] present replacement. Still a start [illegible] with these standard assumptions in [illegible] equipment policy and deducing re- [illegible] judgment of the analyst indicates.

[illegible] under review attempts to develop [illegible] formula together with its [illegible] short cut from the above mentioned [illegible] assumption and considers the various [illegible] associated with replacement of rented [illegible] replacement of ownership by lease. [illegible] interest charge for replacement, rate- [illegible] requirement, capital additions, etc., [illegible] subject is a difficult one. Replace- [illegible] is, after all a complex operation, [illegible] careful study for industrial advance [illegible]. Simplification is possible with [illegible] standard assumptions as to the future; [illegible] cuts may be developed for the full [illegible] procedures. But notwithstanding [illegible] the fact remains that a reliable job [illegible] and effort. Rationalization of this [illegible] offers to most concerns an enormous [illegible] for the energy and expense involved.

The book is an attempt to restate the underlying theory of equipment policy with running criticism on the current practices, and explains with charts and examples the considerations that are to be taken into account in deciding upon a particular policy of equipment from the stand point of the economy as a whole.

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**OBJECTIVES AND MINIMUM STANDARDS OF SOCIAL SECURITY, REPORT IV. (1). Published by International Labour Office, Geneva. To be had of International Labour Organisation, New Delhi, Price Rs. 3/-.**

With the end of the global war, the objectives of social security have been taking new shapes. There is a perceptible change in the outlook among almost all nations regarding the minimum standards of social security. It is desirable that international agreement is arrived at on the various questions arising on the various aspects of the subject. The nature of benefits to be conferred and the categories of beneficiaries under the schemes are also of primary importance. Moreover the financing and administration of the benefits are also points on which clarification is essential. Possibilities of achievements in highly developed countries as well as in the less developed countries also require careful consideration.

The protection of the population in contingencies covered by social security is developing along two main lines, viz.; (1) protection of all residents irrespective of economic status and (2) protection of all gainfully occupied persons and their dependents. Other benefits coming within the scope of social security are medical benefits, cash benefits, family benefits, donation of cash benefits, condition for right to benefit, right of appeal, etc., etc.

Another question of policy that arises in this connection concerning the form of administrative organisation necessary for setting up any social security scheme is whether administration should be retained in the hands of the State or should be delegated to autonomous and semi-autonomous bodies.

Modern ideas about these subjects on all their aspects have been discussed in the book. All those who are interested in studies on social welfare will find the book a most illuminating document.

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**ECONOMIC PLANNING by Seymour E Harris, Prof. of Economics, Harvard University Published by the World Press Ltd., 37, College Street, Calcutta 12. Pages 577, price Rs. 12/8/-**

In the wake of the First Five Year Plan by Russia in 1928 followed by two others transforming the economic face of the country in a dramatic way, there has been a considerable stir about the efficacy of planned economy as instrument for combating the various economic ills from which a country might b

suffering. The world-wide depression which started in 1929-30 accompanied by falling prices and rising unemployment under conditions restricting demand of commodity goods set many countries seriously thinking about economic programmes in contrast to planless society. The war just terminated with its attending devastations has again brought the question of economic planning to the front, and no country being now without its own problems of conservation and allocation of resources, reduced productivity, monetary instability, unemployment, inflationary spiral, exchange difficulties and unbalanced international payment, the pace of economic planning has received considerable momentum at present. The result has been that to-day there is no country worth the name which is without some sort of planned economy. Planned society is the order of the day now. All the important countries are now thinking in terms of regulation of productive processes, controls over consumption of commodities and inland and foreign trade, determination of targets of production, balance of distribution between production of essentials and non essentials and thus are heading life from feudalism via capitalism to socialist stage of life.

The book under review makes a comparative study of the economic plans evolved in fourteen big countries of the world, viz, the United States, the United Kingdom, India, Germany, Greece, Japan, Norway, the Netherlands, France, Poland, Czechoslovakia, Hungary, U. S. S. R., the Argentine and gives a distinctive idea of the shape that planning has taken in those countries under stress of economic conditions and political awakening. The study is particularly useful in as much as it presents a vivid account of the progressive movements in those countries, and surveys the progress made so far there. Countries scheming planned economy can substantially profit by the perusal of the plans and their successes and failures and learn from their hard-earned experiences. The book however does not confine itself merely on the narration of plans in various countries but also analyses in a scholarly way the reasons behind the growing interest in all aspects of planning and the types evolved in each country.

Planning is going ahead in India, and indeed there is plethora of it. It is therefore desirable that we shall have full knowledge of the plannings in other parts of the world and their objectives and manner of operation. The book will fill thus a real need of the country in this respect and deserve carefull reading.

# NOTICES & REVIEWS

**(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this section.)**

**FOUNTAIN PEN INKS**

We have received from Bhivanendra Products Ltd., Katpadi, S. K., 5 phials of fountain pen ink of different shades, such as red, blue black, violet, green, and violet writing ink, which are found to be good.

We have also received from Octagon Sy[illegible]cate, 14, Raja Rajballav Street, Calcutta, [illegible] phial of blue-back fountain pen ink [illegible] preparation is found to be satisfactory.

**REPORT OF THE PATENT OFFICE.**

We are glad to receive a copy [illegible] Report of the Patent Office for the [illegible] which has just been published. Th[illegible] gives a brief survey of the trend of in[illegible] during the period together with statist[illegible] of various proceedings under the Indian [illegible] and Designs Act and also Rules and oth[illegible] information regarding the activities [illegible] Patent Office.

**BULLETINS OF GEOLOGICAL SURVEY**

We have received a copy of Bu[illegible] the Geological Survey of India by J. [illegible] dealing with cement industry in India. [illegible]letin contains statistics of production and imports of cement in India. It a[illegible] with the types of Portland cement man[illegible] in India, specifications, major applica[illegible] cement in the construction of Dams, r[illegible] The bulletin contains a map showing [illegible] sition of suitable limestones in India fo[illegible] manufacture, and list of the cement [illegible]turing companies together with their [illegible]nual production. The bulletin is publ[illegible] order of the Government of India [illegible] available at the office of the Ma[illegible] Publications, Delhi.

**THE PUNJAB ON THE MARCH**

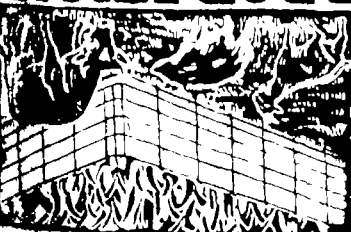
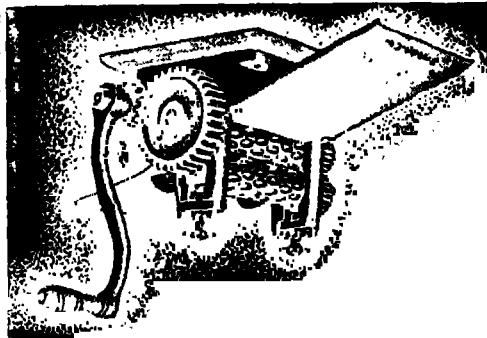
We have received several copie[illegible] above issued by The Public Relation[illegible] ment, Punjab. Each copy deals [illegible] particular subject, such as Rehabi[illegible] Grow More Food; Education and Publ[illegible] Industries and Civil Supplies; Ir[illegible] Public Works Department; Welfare [illegible] Common Man; Local Self Government, Jails and Campaign against Corruptio[illegible] Projects; Veterinary, Fisheries and [illegible] etc. These pamphlets are profusely ill[illegible] to attract attention.

# TRADE ENQUIRIES

**(To communicate with any party write him direct with name and address give[illegible] mentioning Industry.)**

376 I.O., Khatri, No. 25-2/8, Dam[illegible] Colombo 11, Ceylon—Wants to be put [illegible] with the suppliers of velvet powder a[illegible] tion gold ornaments.

641 P.G. Gomez & Co., Chilaw, C[illegible] Want to be put in touch with suppl[illegible] exporters of hemp fibre and hemp ya[illegible] products of green manure called sunn h[illegible].

652 Umesh Paul, P. O. Palasbari Ka[illegible]rup—Wants to be put in touch with the deal[illegible] in birds.

# INDUSTRY PUBLICATIONS

- **Industry Year Book and Directory, 1951** with Classified Lists of Traders & Industries, Newspapers, etc. -- -- -- Rs. 15-0
- **Theory & Practice of Commerce and Business Organisation.** By J. C. Mitra F.S.S. (London), F.R.E.S. Rs. 12-0
- **The Electrician** by V. L. N. Row, B.Sc., (Eng.), A.M.I.E. -- Rs. 6-0
- **Apprentice Shop Practice** by M. N. Swami -- -- -- Rs. 5-8
- **Sell What You Make**—A Treatise on Marketing of Proprietary Articles in India. By F. A. Tyres Maseyk -- -- Rs. 5-0
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- **Safety Matches and Their Manufacture** by K. C. Das Gupta -- Rs. 5-0
- Free Lance by R. Dhara -- -- Rs. 4-0
- **Manufacture of Soap** -- -- Rs. 4-0
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- **Wide World English Correspondence** by K. M. Banerjee -- Rs. 3-8
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- **Prospective Industries** —Manufacture of Boot Polish, Depilatory, Hair Dye, Sealing Wax, Crayons, Metal Polish, Varnishes, Oil Cloth, Carbon Paper, Bottle Waxes, Harness Polishes, Lubricants, etc. -- -- -- Rs. 3-0
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- **Practical Metal Casting** by D. Dey Scholar of City and Guilds Institutes of Technology, London -- Rs. 3-[illegible]
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- **Independent Careers for the Young** Rs. 3-[illegible]
- **Manufacture of Catechu,** By B. Sen Gupta, M.Sc. Rs. 3-[illegible]
- **Manufacture of Syrups & Cold Drinks** Rs. 3-[illegible]
- **Manufacture of Rugger Goods** -- Rs. [illegible]
- **Chemical Industries of India** -- Rs. [illegible]
- **Manufacture of Inks** -- -- Rs. 3-[illegible]
- **Cleark's Manual** -- -- Rs. [illegible]
- **Bengal Sweets** -- -- -- Rs. [illegible]
- **Retail Trade** -- -- Rs. 3-[illegible]
- **Traders' Manual** -- -- Rs. 3-[illegible]
- **Manufacture of Disinfectants and Antiseptics** by M. N. Mitter M.Sc. -- -- -- Rs. 2-[illegible]
- **Dental Preparation** -- Rs. 3-[illegible]
- **Indian Tobacco and Its Preparations** Rs. [illegible]
- **Romance Of Journalish** By Rajani Banerjee — A most comprehensive Guide for one who wants to become a better Reporter a better Sub-Editor, a better News Editor or a better Journalist in the full sense of the Term Rs. [illegible]
- **Industry Prize Articles Vol. II** on Inorganic Salts Rs. 2-0
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- **Manures and Their Application** R. 2-[illegible]
- Mother Earth by R. Dhara, Journalist Re. 2-0
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- **Guide to Trade in Indian Arts and Crafts Goods with U.S.A.** by Durga Pershad B.A. -- Re. 1-8
- **Hints on Pond Fisheries** by B. L. Choudhri, B.Sc. (Agr) Re. 1-0
- **Electric Pump** Re. 1-[illegible]

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- **Plastic Industry** Re. 1-0
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Branch Office :—**30, MOUNT ROAD, MADRAS — 2,**

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CALCUTTA, JULY, 1951.

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## EDITORIAL CONTENTS FOR JULY, 1951



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Subscription money is always payable in advance or by V.P.P.

### ADVERTISEMENT DEPARTMENT.

Last day of accepting advertisement is the 10th day of the previous month. Any order for alteration or correction of copy is not entertained after that day.

Advertisement rates for ordinary and special position, both casual or contractual, are sent on request.

### CORRESPONDENCE.

All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

### OFFICE HOURS.

Editorial Department — 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays.

Subscription and Advertisement Department 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

# —CLASSIFIED BARGAINS

ADVERTISEMENTS under this head of small announcements cost 4 As. per word, minimum Rs. 3 payable by Postage Stamp or M.O. with order. No vouchers given.
To Readers—In writing to advertisers the Readers are requested to write legibly and quote that they are writing in response to advertisement in INDUSTRY. This would ensure prompt attention. Letters to Advt. No. should be duly stamped.

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Miscellaneous Advtg.
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Industry

EDITOR :

K. N. BANERJEE.

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# INDUSTRIAL PROBLEMS

IT is really disappointing to those who wished to see India making good progress towards development of industries over the length and breadth of the country that India has not practically been able to report any satisfactory progress during the last three years of independence. There might have been some improvement in production in certain industries but over the longer segment of their industrial structure, production has remained more or less stagnant.

The major problems which the industries both medium-sized and small-scale are confronting to-day are as follows :—

In India industries, as a matter of fact, have developed in a lop-sided manner without context to the industrial possibilities and needs of the country, as justified by the available raw resources, technical skill, etc. There is a gruelling absence of a spirit of co-ordination and co-operation among the industrialists.

The industries are feeling great hardship in raising funds for the proper conduct of their business. The recent failures of small banks which extended them credit in the hour of their need have greatly undermined their position. There may be some extra money in the hands of some favoured people but unfortunately that money is not available for industrial use.

The cottage industries are living a precarious existence. Though there is an important school of thought in India that India must go the way Japan had gone towards the organisation of small industries it is regrettable that in India cottage industries stand disjointed and out of gear. The handicaps under which they are looking have greatly increased lately with the introduction of controlled economy.

There is no arrangement for long term financial needs of the country. The Industrial Finance Corporation which has been working for the last three years is not in a position to cope with full requirements it is called upon to fulfil. There is need for formation of capital organisations which will advance money to the people for the proper regional development of small scale industries.

*(Continued on page 154)*

**DECENTRALIZATION OF SUGAR INDUSTRY**

A survey of the sugar industry was recently made to investigate if it was feasible to shift the sugar industry from U. P. and Bihar to other areas such as Bombay or Madras. The Government of India indicated their readiness to give financial assistance for such advantageous locations but it appears that in the opinion of the Committee this is not practicable. It appears that, save for one or two transactions, as yet there has not been any sizeable effort to shift sugar factories. There may, however, be according to this survey, some scope for shifting of a few uneconomic factories in U. P.'s eastern districts to more suitable sites in west U. P.

A survey of conditions in Madras shows that factories in that area have an even lower recovery rate than in U. P. and Bihar. Cane supplies are widely dispersed and transport to the factory tends to be expensive. The soil requires a large number of waterings and even with the comparatively high yield of cane per acre, fair price for cane in Madras has been computed at Re. 1/8/- per maund, which is higher than the fair price suggested for U. P. and Bihar. The price factor is often more important to the sugar factory than merely yield per acre. Bombay was more favourably situated in the past because of the Deccan canal system and availability of land for large scale farms. Such large farms may not now be feasible in view of the Government's land policy. Irrigation in Bombay is also difficult and tubewells do not appear to be practicable. Despite the high yield per acre, fair price for cane in Bombay was computed in 191[illegible] by an expert committee at Re. 1/6/- per maund against the same price for Bihar and Re. 1/7/- for U. P. Further, the Bombay Government have already declared that, in the interest of balance between foodgrains and sugarcane, they would not be able to supply more water to sugarcane farms. On the whole it would appear that the sugar industry in U. P. and Bihar has a great future, provided adequate attention is given to development of cane and to making the industry efficient at all stages.

Government officials, technical experts and others directly connected with the sugar industry participated in the survey.

**DEVELOPMENT PLANS OF STATES**

The development plans of the States which constitute an important part of the Planning Commission's report are at present in the final stage of considerati[illegible]

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*(Continued from page 153)*

Commercial policy followed by the Government is not based with an eye to internal requirements of the country but rather to her foreign exchange budget. The result has been that occasions are not rare when the essential raw materials for the industries are in short supply and that too in a most irregular way.

There is no sound organisation to co-ordinate the marketing side of the industries, to look to the production of articles, to control their quality and to introduce standardisation of goods. There is over and above no understanding between capital, labour and consumer. The spirit of swadeshi which moved the country a few years ago is also unfortunately absent.

It is therefore time that the Provincial and Central Governments and the public do think closely on these vital subjects affecting the progress of industries and general welfare of the State and make a co-ordinated plan that will put the industries on their legs.

by the **Commission. Consideration of the** State plans **in the light of the available** inancial **resources of the country and to** ntegrate **them into common national** plan of **India has been taken up by** he Commission **since April 10 last** and so far **the plans of Assam, Bombay,** Hyderabad, **Madhya Bharat, Madhya** Pradesh, **Madras, Mysore, Orissa, Punjab,** Pepsu, **Rajasthan, Travancore-Cochin** Union, **Uttar Pradesh and West Bengal** and the **tribal areas of Assam have** been discussed. **The plans of Bihar,** Jammu **and Kashmir State and Saurashtra** and of **Part C. states remain to be** considered **and they will be finalised** shortly.

The development plans of the States have been classified by the Commission under six broad heads, viz. (1) agriculture and rural development ; (2) major irrigation and power projects ; (3) cottage and other industries excluding those which come in the private sector ; (4) transport including roads ; (5) social services including education, housing labour and labour welfare etc., and (6) rehabilitation of displaced persons.

Agricultural schemes and irrigation and power projects which have a direct bearing on the food situation in the country have been considered in great detail, keeping in view their possible additional contribution to food production. In regard to the new schemes of irrigation included in the state plans, the Commission has found that a number of irrigation and power projects have been launched in different parts of the country without adequate investigation of assessment of sources with the result that an avoidable strain has been caused on the available financial resources for development projects. It has proposed that a suitable machinery should be set up for exercising necessary scrutiny before new projects are commenced.

With the completion of the consideration of the State plans the Commission have finalised one important aspect of its work, namely, the programme in the public sector including the Centre and the States. In the other two aspects of planning which will be dealt with in the report, namely, (1) assessment of resources and recommendations on questions of policy and (2) proposals for the private sector **considerable progress has also been made. Detailed study of several industries with the representatives of the industries concerned has been made. These cover fertilizer, cement, cotton textiles, iron and steel, leather and leather goods, paper, glass, sugar, aluminium, agricultural implements and machinery. Rationalisation of the industry with its associated problem of rehabilitation of the retrenched personnel has also been considered.**

The report is expected to be **in two** parts, one, dealing with the **short term** plans to be finalised by **1953-54 and the** other a comprehensive **Five-Year Plan** ending 1955-56 which would **cover a wide** field involving questions of **national policy.** This would include **recommendations for** improvement in the public **administration,** machinery for the execution of **plans at** the Centre and the States, **public co-operation,** reorganisation of the **system of** agriculture, development of **cottage and** small scale industries, the **future organisation** of industry, conservation of **mineral** resources, development of **irrigation and** power, etc. etc.

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**LABOUR POLICY**

The All-India Organization of **Industrial** Employers has urged **review by the** Planning Commission of the **Government** of India's Labour policy, **with particular** reference to legislation. It **was said that** such a review was warranted not only in the interest of industry but also in the interests of the country and labour. **It is** stated that while some **labour laws had** been intended mainly to **consolidate and** improve the existing **legislation, most** others had extended the scope of **legislation** to field which should normally **be outside** it. Legislation had been **undertaken on** such diverse matters as **fixation of wages,** settlement of disputes and the **provision of** social security to workers, etc.

The Organisation, therefore, **felt that** unless a thorough review of **labour policy** was made and it was adjusted **to the** general framework of the **country's** economy and the stage of **economic** development, the well-intended **measures of** labour legislation would have the **unexpected** yet the most **natural result of** putting a brake on **India's economic**

progress. On the psychological plane, the Organisation wanted the parties concerned to have an attitude of co-operation, as no useful purpose in its opinion, could be achieved unless both the parties realized their responsibilities more than their rights. It would be more in the interest of the country if the Government guided industry rather than directed it through elaborate legislative measures. The Communication further explained the difficulties the employers faced in implementing the Minimum Wages Act and the Employers State Insurance Act, and submitted that, while increased burdens were being placed on industry without regard to its capacity to bear them, the attitude of labour was not accommodating.

The Organisation therefore felt that if the provision of these facilities was enforced by legislation, those sections of the industry which were not much above the margin would have to close down. An aspect to be considered here was whether consumers could afford to pay the high prices resulting from enhanced labour cost.

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**AQUARIUM IN BOMBAY**

India had great scope for the development of the fishery industry which is as important as the development of agriculture or dairy-farming to meet the requirement of food. The more so because India has an extensive sea-coast of about 4,000 miles and is endowed with numerous big rivers, lakes and legions of artificial tanks, big and small, all of which provide an excellent source of fish in these days of scarcity of food. It is for these reasons that the question of the establishment of an aquarium in Bombay had long engaged attention of many people during the past quarter of a century. It was long felt that such an institution would enable extensive and intensive research to be carried out in marine life which teemed in our waters and on which so many people were dependent for food. In fact, a marine biological station is a prime need in the training of all students who desire to have a true insight into the working of animal life. Some idea of the vast importance attached in Europe to marine biological work may be obtained from the large number of marine and fresh water stations which dot its coast-line. France alone has about 28 and ap from those subsisting through Munic or Government support, there are s conducted by private bodies such as University of Montpellier. It is there heartening that an aquarium has l lately inaugurated in Bombay. It housed in a two-storeyed structure, l at a distance of about 200 feet from sea-wall, and contains varied species inland and imported fishes. The bulk fishes have been specially imported f the Philippines, Java, Sumatra, Siam Malaya, etc. The preponderant numbe these exotic fishes come from Singap in Malaya. All these imported varie have been acclimatised to our wat where they have established themse and are being bred.

The laboratories in the aquar provide room for a dozen resea workers. It has up-to-date facilities s as arrangements for the supply of pur sea and fresh water, products to e proper aeration, gas, paraffin baths, optical instruments.

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**PAINT INDUSTRY**

The crisis now facing the p industry in this country, particularly regard to the procurement of essential materials from abroad, was referred to annual meeting of the Indian P Manufacturers' Association. It was that failure of the Government liberalize its import policy earlie delay by the Import Authorit granting licences had resulted industry losing substantial supplies materials in foreign markets. Citi case of a particular ingredient used manufacture of paint it was said as late as July and August last y was available at between £. 40 and per ton, but the present price of the dient was well over £. 100 per ton. It therefore to be desired that the Govern ment give greater assistance to industries in their search for raw mat abroad, and that Indian Embassies Trade Commissioners in various count be instructed to act as the countr commercial agents abroad and to h industries not only by obtaining infor tion of the availability of raw materi

ut also by introducing them to reliable arties overseas. The concensus of pinion was that a Central Marketing )rganization should eliminate cut-throat ompetition which has affected the quality of products offered for sale.

### THE EFFECTS OF INFLATION

At present, there was perhaps no [illegible] problem of greater consequence o the country than what was generally eferred to as inflation. The present nternational situation, leading to a re-armament drive and the accumulation of materials required for it, had resulted in [illegible] wave of inflation. The position [illegible] which called for careful thinking nd [illegible]ling. Dr. Mathai, the ex-finance [illegible] of India, reverted to this vital [illegible] in a speech recently delivered by him. He said that of the various remedies proposed for inflation, one of the [illegible] and perhaps the most orthodox, was increased taxation as a means of [illegible] away surplus purchasing power. [illegible] remedy, however, was of doubtful [illegible] in the present circumstances of [illegible] Neither direct nor indirect taxation [illegible] levels they had already reached [illegible] scope for further expansion. Not [illegible] would it cut into possible savings which might be employed in productive investment, but in the case of large sections of the population, it would lower what was [illegible] an alarmingly low standard of [illegible] The extension of banking facilities in rural areas and the provision of further incentives for saving among agriculturists had possibilities which should be more fully explored. It was generally admitted that the final solution of the problem of inflation lay in increased production. The agricultural plans which were under consideration, were mainly concerned with bringing new lands under cultivation. In manufacturing industries production was slowing down partly for lack of materials but mainly because the plant and machinery, particularly during the war years, had been worked at a pressure which greatly intensified the wear and tear. It was impossible to replace worn-out plant and machinery to-day except at a cost several times higher than pre-war costs. He further added that better and more immediate results in the way of production would be secured if adequate facilities were provided immediately, for replacement of existing plant and machinery, rather than by setting up new units of production. It was further urged that the system of controls as obtaining now, did not provide a permanent solution for inflation but was only a means of temporarily suppressing some of its worst results. The inflationary potential remained just the same so long as the main factors underlying inflation were not removed. The result of the abolition of food control in December 1947 was a striking illustration of what would happen if controls were removed without a change in the basic factors of inflation.

## NOTICE TO OUR READERS AND ADVERTISERS

An apology is due to our readers and advertisers for delay in [illegible] the current issue of Industry. It is caused by a long-drawn gas [illegible] which cuts off completely our supply of gas for operating our [illegible] machines. We marked time for some days in expectation of [illegible] of the strike but as it still continues we had to resort to other [illegible]gements for its issue.

We crave the indulgence of our readers and advertisers for this [illegible] which is beyond our control.

CHARACTERISTICS of the Indian soil and the ways and means of their nprovement for extensive and intensive ultivation for crop production and suitbility of different soils for different gricultural products were discussed in the ıst April issue.

The present article is devoted to uccinct description of the methods of ultivation of food and money crops. It s regrettable that due to limited space at ur command it has not been possible to go nto details about the modes of cultivation f all crops. We, therefore, confine our ttention in this article to the more nportant of the crops grown in the ountry for domestic consumption or xport.

## RICE

RICE is the most important food crop. It is extensively cultivated in all the varmer parts of the globe. It is essenially a crop of damp semi-tropical or ropical countries. It thrives under ery great diversity of climate and culture. t grows well in dry climates or at least ry in comparison with Burmah, Bengal, nd the Konkan districts of the Bombay Presidency. The finest varieties and the argest yields per acre are produced in istricts where there is a moderate degree f sunshine and a damp, warm atmosphere.

India has a very extensive area, on an verage, considerably exceeding 70 million cres annually.

There are three different classes of rice r paddy in Bengal, viz :—

st .. Aus paddy, high land rice or summer crops,

nd .. Aman paddy, transplanted rice, or autumn crops, and

rd .. Boro paddy, very low land rice, or winter crop.

Each class is controlled by the water upply. On land that becomes dry in eptember, aus paddy is taken. The crop s sown broadcast in May, or it may be ransplanted in June and will be ready for arvesting early in September. Each istrict has its own special varieties which re generally coarse grained. Finer varieties of aus paddy grows extensively in Central Provinces but in Bengal it is not regarded so important as Aman variety. When there is a plentiful supply of water on the land in October aman paddy is taken. Seed is generally sown in seedbed in early June, the crop is transplanted out in the field in July, and the crop is harvested in December. Sometimes seed is sown broadcast in the fields but transplanting is the best method and gives the best outturn.

There are thousands of so-called varieties of this class of paddy, but most of the differences are due only to environment.

Boro paddy is not so important as the other two classes. Lands that flood from June or July to November are put under boro paddy when the flood subsides in December. Seed is sown in the seedbed in December, transplanted in January and the crop is ready for harvesting in two months. In North Bihar boro paddy is taken in the beds of rivers and streams when the water subsides. Boro paddy is generally coarse grained.

From the above it will be seen that paddy can be grown all the year round according to the water supply.

### PREPARATION OF THE LAND

Five or six ploughings and two or three ladderings give the necessary tilth for sowing broadcast. For transplanted paddy the land is ploughed 2 or 3 times in puddle (out of the 6 ploughings) and laddered twice until the field has the consistency of soft mud when transplanting can take place. Boro paddy is treated like aman paddy.

### SEED AND SELECTION THEREOF

Choose the variety that is suitable according to the local demand and see that seed true to type is obtained. See that the sample is clean, free from dirt and weed seeds, not weevil-eaten, plump and fresh. Old shrivelled seeds germinate badly and produce weakly seedlings

### SOWING TIME

This depends on whether the paddy is aus, aman or boro. Aus is sown in May

transplanted in June. Aman paddy should be sown in seedbed in the first of June.* This date is very import- in order that the seedlings may be planted by the middle of July. Every after the 15th of July acts against a mum outturn being obtained and day after the 15th July increases the ..uring from drought or flood. But ..gal this date is not the limit of ..g because its climatic condition is different from other places. Boro .. may be sown and transplanted in ..r, December and January accord .. the supply of water and risk of

**QUANTITY OF SEED**

.. broadcasting, the quantity of seed ..ated by the fineness of the grain. .. seers of a fine grained paddy and .. seers of a coarse grained paddy ..ient seed per acre. In transplant- .. seers of seed, either coarse or fine ..d paddy, sown on 1/15th of an acre, .. sufficient seedlings to transplant .. of land.

.. transplanting it has been found that .. 1 seedling every 8 to 10 inches .. a better outturn than 2, 4 or 8 ..

**MANURES**

.. following manures are generally .. in cultivating paddy:—

.. 50 maunds of cowdung, or

.. 6 maunds of castor cake per acre, or

.. green manure with dhaincha.

.. may be employed by everybody .. should be learnt by heart by .. cultivator. Of course, there are .. manures, but the kinds and quanti- .. should be tried carefully first before .. large quantities on large areas.

..dung or castor cake should be ap- before ploughing in puddle. Dhain- .. (6 seers per acre) should be sown .. or May according to rain fall and .. under (green manured) at the .. puddling the land for translanting. .. the accumulation of water is too ..d surface damage too free manure .. be applied. But the manures are .. to be washed out during very heavy rainfall, and these must be compensated by the addition of oil-cake, cowdung or tank-earth. Saltpetre is not employed as a manure in Bengal, though in regions of short rainfall, this manure is suitable for all kinds of paddy.

**AFTER CULTIVATION**

After cultivation with aman paddy consists simply of weeding once (generally) by means of the *Khurpi.*

With aus paddy one or two weedings are given. Sometimes the crop is partially ploughed. This loosens the soil and gives the paddy plant a better chance of spreading the roots and of tillering. Weeding is also thereby facilitated.

**HARVESTING**

The crop is harvested when the straw turns yellow or becomes dead ripe. Aus paddy should not be allowed to get too ripe. It sheds more brittle than aman straw, and it easily gets broken. This is another reason for cutting aus while it is still somewhat green. The corn is cut close to the ground and left in parallel lines in the field for about one week. Afterwards sheaves are made, and 100 to 150 sheaves stooked together, and soon after threshed in the threshing.

**WINNOWING**

At threshing time the larger part of the straw is removed and what is left is composed of grain, chaff, small bits of straw and dirt. Winnowing simply consists of allowing the mixture of grain and chaff to fall 5-6 feet on a windy day where the grain falls, and in falling, the chaff, being lighter, is blown away from the grain. In this manner the grain can be perfectly cleaned. The experience the cultivators have of cleaning their grain with the help of nature is really wonderful.

In Western countries threshing and winnowing are performed together by means of the steam thresher.

Threshing and winnowing machines are invented for cleaning grain, but in Bengal we are not yet convinced of its necessity for the small cultivator. It would mean capital expenditure which Indian cultivator requires for other things first. When our cultivators work on co-operative

basis improved implements for harvesting, threshing and winnowing may come into vogue.

#### STORING

The methods of storing grain in vogue amongst the cultivators are also simple in the extreme, and yet, wonderful to relate, they keep the grain dry and sound.

Some make ropes of straw and make these ropes of straw into balls, 1 yard in diameter, with paddy in the inside. These balls are stored in their houses. The grain is kept in perfect condition in these balls.

Other cultivators build houses of straw or bamboos on stilts to keep them above the water level in times of flood and the grain is kept in excellent condition.

Other cultivators use earthen jars. These are filled with grain and then covered up with a lid and the lid is made water-tight and air-tight by means of cowdung plaster. If before closing the lid a piece of cotton were dipped in carbon bisulphide and placed inside the jar, these jars would be perfect so far as the storing of grain is concerned.

## WHEAT

After rice, very nearly the largest area cropped in India is wheat. Its cultivation is prehistoric in the old world. It is grown best in the drier parts of the temperate zone, but its limits of growth are wide, and the varieties in cultivation are so numerous that some are adapted to grow in any country outside the Artic limits. In India approximately 30 million acres are cultivated with wheat, mostly in Northern Provinces and States. The young seedlings of the hardier varieties are not killed by frost, but frost or cold causes damage when the crop is approaching maturity.

#### VARIETIES

There are several species and many varieties of wheat, but it will suffice here to mention the Muzaffarnagar white, Buxar white and red deshi (U. P.) varieties. They are all good.

#### IRRIGATION

The dry and cold winter is favourable for the growth of wheat and that the moist warm places are unsuitable for growing this crop, with the exception of a few sandy tracts, the value of irrigation for wheat doubtful in Bengal, and the crop in soils is usually raised without irrigati The advantage in favour of irrigation, great in the U. P. and the Punjab. In former, the average yield of wheat in irrigated area is 800 lbs. and in irrigat area 6280 lbs. per acre; and in the Punj 576 lbs. in unirrigated area and 917 lb in irrigated area. In Bombay the diffe ence is still greater in favour of irrigati 1250 lbs. per acre being the yield of irrig ted against 510 lbs. the yield of unirrigate area. The difference in the M. P. is abo the same as in the case of the Punjab.

#### SOIL

Clay-loam, easy of irrigation situate in a dry locality, is the best soil to choos for wheat. Sandy loams are also utilise for growing wheat, especially dearth of ne alluvial lands, where mixtures of whea and barley or wheat and mustard or li seed are commonly taken. The best crop of wheat are grown on lands newly brough under canal-irrigation. Where canal-wate is used for irrigation for a number of year the outturn is found to fall off even belo the original level. This is due (1) to ex cessive use of water for irrigation whic washes away valuable food-constituent an brings up to the soil undesirable solubl salts, and (2) exhaustion caused by th taking of heavy crops at first withou manure.

#### SELECTION OF SEED

Choose the variety that is desired an see that a clean plump sample of seed, fr from foreign and weevil eaten grain is ob tained, and make sure that the percentag of germination is satisfactory. At harve time mark the strongest and healthie plants and place them at one side to gi the requisite seed supply for the followi year.

#### TIME OF SOWING

The time to sow the wheat crop is October and November according to th supply of moisture in the soil.

#### QUANTITY OF SEED

The quantity of seed required is 50 t 60 seers per acre.

#### CULTIVATION

Shortly, the land is to be ploughed an cross-ploughed, first with the coun

ugh or some improved plough and then ltivated with the grubber, as often as nvenient, and operations commenced as on after the rains are over as possible. hen by ploughing, cross-ploughing, grubng, harrowing, and rolling, land has been epared deeply and thoroughly (all the erations following close one upon anher, that there may be no undue loss of oisture), seed should be sown by drilling. t least a fortnight's time must be allowed for the proper aerification of soil between the first ploughing and the sowing. rolling or laddering is done after each erati n there will be little loss of moisre ... a fortnight's time soon after the ... are over. Deep cultivation is visable for the wheat crop, hence grubng is recommended. Sowing should be ne after the cold weather properly sets , i.e., somewhat later than when barley d other rabi crops are sown. The middle November is ordinarily the best time for ower Bengal. In rocky and laterite soils wing should be done earlier, say about e 20th or 25th October, or earlier still if e rains cease early in October. About 0 lbs. of seed are commonly used per re, but this is too much. 50 lbs. are ite enough. After sowing, the field ould be divided out into irrigation-beds y scraping up little banks of earth with a ... shovel may very well be introduced to practice in Bengal for making little rigation-beds. If the soil is too dry, it ould be irrigated before sowing. Three four irrigations altogether are ample for ... ; but one or two irrigations are ... required, though in moist tracts rigation may be altogether dispensed with ... wheat and barley crops. In such ..., however, wheat does not do well. here the natural climatic conditions in ... are exceptionally favourable, no ... may be required. One hand... should be done within a week or ... after the first watering. Two ... with the American wheel-hoe may ... afterwards to promote the growth ...

### MANURING

... wheat crop is generally not ... The manure is applied to the ... in the rotation. If manures are ... they are spread before sowing the ... The average outturn per acre is very small in India, in comparison with England and the crops well respond to manuring. The following may be applied with economy:

(1) 80 maunds cowdung or

(2) 80 maunds pondrette (night soil).

Applications of 1 maund of saltpetre have given excellent results in India. The quantity of saltpetre required is 1½ maund per acre (top-dressed). If the land is found to be poor 1½ maund of bonemeal should be used beforehand at the time of ploughing, though no immediate benefit will be derived from such application. Five maunds of oil-cake may be used instead. But better immediate effect will be obtained from the saltpetre. The best manure to apply varies much, however, with the locality, and no general statements can be made. No manure is required for dearth land which is annually renovated with silt.

### ROTATION

Juar or other millets and wheat are commonly grown in rotation, though both are grain-crops. Juar and barley being surface feeders may be grown together or successively with wheat which is a deep-rooted crop. But better result would be obtained from Kulthi, or Bhadoi Mung, or Bhadoi Kalai being grown before wheat. Lentils or gram grown along with wheat is, theoretically speaking, not a bad practice as the leguminous crop supports the wheat-crop and prevents exhaustion of soil; but mixed crops with wheat are found to be undesirable for more than one reason.

### AFTER CULTIVATION

After cultivation consists of 1 or 2 weedings with the khurpi and 1-3 irrigations according to the locality. In several districts irrigation is not necessary. If rain falls and the soil surface becomes caked run the bhida across the land 2 or 3 times to get the necessary mulch to retain the soil moisture.

### HARVESTING

Wheat harvest should be commenced after the grains are quite ripe and the straw quite dry and crisp.

Now to obtain a successful outturn the points should be observed.

(1) **The seed should be of the best variety suited to the locality in which it is grown; (2) a rust-resisting variety should be chosen; (3) the soil should be deeply cultivated, as deeper cultivation is required for wheat than for rice, barley, and oats; (4) saltpetre should be used for top-dressing; (5) it should not be sown mixed with other crops, and the seed used should be unmixed and select, and the threshing should be as clean as possible; (6) sowing should not be done until the cold weather fairly sets in, barley and oats being sown earlier in the season; (7) if there is not sufficient moisture at the time, land should be irrigated and bakhared afterwards before sowing;** (8) wheat should be twice irrigated, if possible, in wheat districts proper, and the sites chosen for wheat land should therefore be close to water; (9) harvesting should be done after the grain is thoroughly ripe; (10) grain should be stored so that there may be complete protection against weevils. Paddy and oats are not so subject to the attack of weevils as wheat, and cultivators often find their wheat seed completely destroyed by weevils at sowing time, and their sowing of wheat seed results always in more or less partial germination ; (11) Wheat seed should be sown after pickling, to avoid smut, insect-pests, and damage by birds.

The subject of storing of grains against weevils and pickling will be discussed in the part devoted to Insect and Fungus Pests.

## BARLEY

Barley is grown to a small extent all over India and chiefly in the Uttar Pradesh either by itself, or mixed with wheat, or gram, or with peas, or lentils.

### CULTIVATION

Barley is grown to a small extent all over India and chiefly in the Uttar Pradesh either by itself, or mixed with wheat, or gram, or with peas, or lentils. The most favourite mixture is barley and gram. Barley and wheat as a mixture is not so popular, but barley as surface feeder and wheat as a mixture is not so popular, but barley as surface feeder and wheat as a sub-soil feeder may be grown together in rich soils. Rape (Brassica campestris), mustard (Brassica vuncea), taramani or tiramira (Eruca sativa), and linseed are **also grown along with barley.** Lighte[r soil] **is preferred for barley than** for w[heat]. **The land is prepared, and the seed so[wn a] little earlier in the season than** wheat [un]less they are sown together. About ... lbs. of seed are used per acre. A ... more seed is required for barley than wheat, but 100 lbs. per acre is too li[beral] an allowance. Seed properly stored [and] protected against weevils germinates [pro]perly and smaller quantitites of such are sufficient; 60 to 70 lbs. of barley sh[ould] be ample to sow an acre. Barley is a [har]dier crop than wheat and it does not req[uire] the same amount of weeding and irrigat[ion] and it is not so subject to rust. It ca[n be] also grown more successfully in diffe[rent] climates than wheat, which does not d[o] well in warm and moist regions as ba[rley] does. One hoeing with the Amer[ican] (Planet Jr.) wheel-hoe and one manu[ring] with 1 maund of saltpetre per acre may [be] applied with great advantage when [the] plants are above six inches high. In Be[ngal] no irrigation is practised for barley. [The] harvesting should be done earlier t[han] wheat, i.e., before the grains are very r[ipe]. The cut sheaves may be made to stand v[ertically] ears upwards, near the threshing floor [and] when the grains are quite dry they can [be] threshed or failed out.

## MAIZE OR INDIAN CORN

The maize or Indian corn is one [of] the most valuable cereals and is cu[lti]vated at present in all parts of [the] world. In remote antiquity however it w[as] not known in the Old World but exclusiv[ely] grown by the Peruvians and Mexicans. [It] has, however, been found suitable for [In]dian soil and is now grown successfully [in] the cold hills of Sikkim and Bhutan, as w[ell] as in the hot and arid soil of Manbhum a[nd] Singhbhum. It does well in the mo[ist] climate of Bengal and in the dry climate [of] Uttar Pradesh, Rajputana, and the Punj[ab], forming a principal article of diet am[ong] the poor.

Maize plant is a tall, annual gra[ss] reaching a height of 6 to 8 feet, and has [a] solid stem which, when young contains [a] large amount of sugar. The leaves a[re] large, with a wavy margin, and vary i[n] colour according to the variety of mai[ze]. The flowers are of two kinds, viz., the ma[le] flowers, borne at the end of stalk, and th[e]

..le flowers, protected by the bases of leaves forming a "Cob" with a silky plume of stigmas hanging at end. The female flowers are ..nated by the wind, which scatters ..loose, dry pollen on to the thread-like ..mas. The cob varies in length from ..11 inches, and contains 8 to 24 rows ..sely packed grains.

### CLASSIFICATION

As already indicated originally maize ..came from America to India. There ..now regular Indian types but the ..wing three varieties are generally ..g..sed :—

1. Large-cobbed dry grain variety producing yellow grains.
2. The class that produces sweet and large green cobs, usually white, for roasting or boiling purposes.
3. The class that gives the best "popped Corn" (khai).

White, yellow, red and black varieties also distinguished, and then there is further distinction between kharif and ..maize, also between those which take about 3 months growing and those ..h take as many as six.

### CORN FLOUR

Maize grain, both green and dry, ..ed and uncooked, is somewhat difficult ..gest. But made into meal and cooked, ..easily digested. Corn-flour is manu..red by first steeping the maize in hot ..r and then grinding it between large ..stones. The pulp is then passed ..gh sieves into huge vats where the ..h.. settles, the gluten remaining in ..sieves.

### MANURING AND ROTATION

M.. is an exhausting crop and it ..heavy manuring or very good soil ..to give a better yield. Carrots are ..ly sown in Uttar Pradesh between ..s of rabi maize, while the ..still standing, especially when ..is threatened. The leaves of the ..given to cattle and the roots are ..by people. In years of heavy rain-..m, poppy, mustard or safflower ..maize. But wheat or barley is often ..n after maize, though it is against the ..ple of rotation of crops to do so. In some parts of the Punjab three crops are taken in succession in the same year from the same land. Melon is grown after wheat or barley is off the ground in March and land is prepared early in July for the maize crop as by then the melon crop is over.

### SOIL

As the maize prefers deep, rich, warm, and well-watered soil for its successful growth the nature of the soil is an important factor to be considered first. The hilly regions of the Darjeeling district are especially suited for growing high class maizes. In Lohardaga, Singhbhum, Manbhum, and in Bihar districts also, large crops of maize are cultivated. The damp alluvial lowlands of Bengal are not so suited for this crop, if it is intended for grain. But homesteads, throughout Bengal, where no waterlogging takes place, are well adapted for growing maize for green cobs.

### CULTIVATION

The usual season for sowing the seed is about the beginning of the rains, even in the hills. After a good shower of rain, the land already ploughed up once in the winter months should be ploughed and harrowed. The ground being thus prepared and manured, drills may be made 3 feet apart the seed of the best variety sown about 2 to 3 inches deep and about 6 inches apart, the seedlings being afterwards thinned out to distances about 12 inches ; or 3 or 4 seeds may be sown together, in holes about 12 or 15 inches apart, afterwards thinning out the weaker plants when a few inches high. In rich soil wider spacing is necessary. About 3 or 4 seers of seed is thus required to sow an acre. When the plants have grown 1½ to 2 ft. high one hand-weeding should be given. If the soil is found too dry 3 days after sowing and no rain is immediately expected, it is safe to irrigate the land once. Early sowing with irrigation, if necessary, gives much better result than late sowing when no irrigation is required owing to the monsoon being in full swing. Heavy rain does the greatest harm to maize plants when they are yet of small size. No harm is done to maize plants by heavy rains if the plants have in the meantime attained the height of 9 to 18 inches. If

irrigation is easy, it is better to sow the seed in April or May just after a good shower of rain, as the draught subsequent to a free germination is not so injurious to maize plants which are deeprooted plants, and irrigation may be resorted to if there is prolonged draught. After one hand-weeding, two hoeings would give the plants a very good start. The use of salt-petre would be of further benefit. If the land is known to be poor, cow-dung or some other general manure, applied in the cold weather or before sowing would give better results.

### OUTPUT

It is more profitable to sell the green cobs and use the stalks for fodder wherever there is a demand for them than to let the grain ripen. The cobs can be picked and sold in June, and August. If they are allowed to mature, harvesting should be done in September, or when the grains are quite red ripe and dry. In Bihar sowing generally takes place in July and harvesting from October to December according to variety. Ordinarily 5 to 8 maunds of grain per acre is considered a fair yield, but 30 or 40 maunds are occasionally obtained.

## JUTE

Jute is an annual plant that is cultivated for its fibre. It requires about the same soil and climate as rice, but it cannot stand water-logging. There are two species of jute, viz :

Corchorus Capsularis and
Corchorus Olitorius.

Corchorus Capsularis has rounded capsules (fruits). Corchorus Olitorius has long pads (fruits). Of these two species, many so-called varieties are grown. Corchorus Capsularis appears to be generally green stemmed, while Corchorus Olitorius is either red-stemmed or green-stemmed. This appears to be the case throughout Bengal. A green-stemmed Capsularis or a red-stemmed Olitorius should be chosen as giving the best results. Jute requires plenty of moisture to grow well, but it cannot stand water-logging. It grows well on all soils, either high-lying or low-lying, provided the requisite water is obtained.

### PREPARATION OF THE LAND

The requisite tilth for sowing is obtained by 7-8 ploughings and three ladderings. Manure is applied just before sowing the seeds.

### SELECTION OF SEED

Good clean shiny seed of the variety required should be selected for sowing. Strong healthy plants should be selected in the field for the production of the seed supply for the following year. Before sowing, the seed should be subjected to a germinating test and 90 per cent, germination should be obtained.

### TIME OF SOWING

The best time for sowing jute seed is immediately after the first showers of April and May, so that the plants may be strong enough to withstand the heavy rains of June and July.

### QUANTITY OF SEED

In cultivating jute generally [illegible] seers of seed per acre is required provided the seed germinates at least 90 per cent.

### CULTIVATION

The seed should be sown by drilling only nine inches apart, so that hoeing with wheel-hoe or bullock-hoe may be done. Hoeing at least once should be done after sowing when the plants are well up, and if possible, one hand-hoeing and one wheel-hoeing or bullock-hoeing the two operations before the rains set in regularly, when wheel or bullock-hoeing will not be feasible, or the wheel or bullock-hoeing may be done when the land is not too wet, and the weeds pulled up with hand when the rains have set in properly. Cultivators use the *bidia* after germination to loosen the soil and uproot extra plants.

### MANURE

The following manurial applications have proved economical in Bengal and they should be noted :—

(1) Sixty eight and a half maunds of cowdung or
(2) Seven maunds of castor cake.

### AFTER-CULTIVATION

The after-cultivation consists of three bidia-rings, one thinning, two weedings and

or two waterings (if necessary) ...ding to the degree of moisture of the ... the crop is then ready to be cut in ...middle of August and the process of ...g commences.

### HARVESTING

The jute plants are generally cut with ...le, but in very low-lying lands simply ...ed. In either case the plants are ...n bundles and left on the field for two

### STEEPING OR RETTING

The fibre is found on the outer layer ...e stem and is mixed with gum and ...ble matter which must be removed ...he process of removing these is called ...g.

The bundles of jute are placed in a ...pit) of gently running water and ...under water by means of bamboos or ... Some people plant bamboos aginst ...tream to prevent the bundles being ...ed away. Bacteria which live upon ...m contained in the hard rapidly free ...ure fibre and in 10 to 20 days after ...ing in water the process is complete. ...bundles now are taken out of the ... and the fibre is extracted by heating ...tems-with a stick and stripping off ...fibre from the pitch which is left ...d. This process is called stripping. ...fibre is then cleaned by washing in ... water. This cleaned fibre is then ...g out and placed on bamboos in the ... dry. When dry, the fibre is made ...bales and is ready for the market.

### SUGGESTION FOR IMPROVEMENT

The following directions have been ...mended by experts for improving the ... f jute :—

(1) Thin sowing ; (2) Reservation of ... portion of crop for seed which ...d be allowed to mature fully ; (3) ...ting when pods have begun to form ; ...ing preparation of soil ; (5) Ex... of seed with some district where ...soil and climate are somewhat ...

## SUGARCANE

The sugarcane is a perennial grass ...thick solid jointed juicy stems reach... height of 8 to 12 feet. The stem is a cylinder and ending in a slender hollow top which bears the flowers. The roots are fibrous and wide spreading, either keeping near the surface of the soil or going deep down. In loose soil they stike straight down to a great depth. The larger fibres fix the plant, while the smaller ones which are very numerous are the feeding roots. Hence it will be understood at once that in order to obtain a good crop the soil should be prepared with extra care in order to give the roots the best possible chance. The sugar is contained in the stem. When young the stem is carefully protected by a sheath of rather coarse leaves. The sugarcane has so many enemies, not only insects always on the look-out for secret things, but even carnivorous animals have a weakness for the sweet juice, and jackals, wild pigs, and monkeys have to be guarded against. The joints are called nodes and the smooth portions between them are called internodes. Leaves which look like blades grow laterally and are alternate. The green cells of the plant prepare under the influence of the sun most of the sugar which when ready is stored in the stem.

### VARIETIES

There are many varieties of sugarcane in India. Some are thick stemmed, others are thin stemmed ; some are draught resisters, others can put up with lots of water ; some are soft skinned, while others are hard ; some are very long stemmed, while others are short. These names are as follows :—Malabari, vansi, bhuri, shojbhuri, songadi, kali, judi, deogadi, mahim yellow-green, green mauritius, bullu kaffu, red mauritius, etc.

### PREPARATION OF LAND

The land must be ploughed, cross ploughed, and laddered till a fine tilth is obtained. This is obtained by 8-10 ploughings and 4-5 ladderings.

If the sets are planted on the plough furrow, this is all the preparation the land gets. If the ridge and furrow system of planting is adopted, the land is drawn up into furrows 2½″ wide separated by ridges 2½″ wide. These furrows are laid according to the level of the land, so that irrigation is easy. If the Poona bed system of planting is adopted, the land is laid out in beds 10 feet square with irrigating wide

parated by furrows 2½" wide. If the auritius pit system is adopted when the cessary tilth is obtained the land is set it with pits (1 foot deep and 1 foot in ameter) three feet apart each way.

### SELECTION OF SEEDS OR CUTTINGS

Choose the variety that is wanted and e that strong healthy sets are obtained. ich set should have at least 2 internodes 3 nodes and must contain buds. The ed is best selected at harvest time. Take e strongest and healthiest canes when eparing for the crushing mill and cut off e tops for planting purposes. These tops e of very little value for crushing and are cellent for seed.

### TIME OF SOWING

The best time for sowing cane is when e cane is being harvested. Harvest the ne, and carry the canes to the crushing lls after, which the extra men can best employed in planting the next year's op.

Accordingly December, January bruary and March are the months for anting cane. The earlier the cane is anted the better, in order that the cane ay be well established before the hot ather sets in.

### QUANTITY OF SEED

The quantity of seed required per acre pends upon the method of planting. anting on the plough furrow requires an ormous number of sets in comparison th the ridge and furrow system of planting. If whole canes are employed for anting, more sets will be required than only parts of the stem (sets) are used. the land is badly infested by white ants, iole canes should be planted. This gives od for the white ants, while the young oots are taking root, after which flooding e land keeps the white ants in check .

The number of sets planting in the ough furrow on an acre of land can sily be worked out. Each line is 9 inches art and sets are planted 1 foot apart in e line (66' × 132' = ⅛ th acre). In e ridge and furrow system of planting ere are two rows in every 5 feet. In ort, planting on the plough furrow gions three times more seed is required an that of the ridge furrow system. In this ridge and furrow system 17,160 sets are required per acre.

### PICKLING

As sugarcane is very much subject to the attack of insect and fungus pests, it is important to sow the cuttings or seedlings after pickling, i.e., after fungicides. But as these substances even when used in a dilute form are generally injurious to vegetable cells, it is best to dry up the substances with which the cuttings or seedlings are smeared immediately afterwards with such manurial substances as have some effect in keeping out insects also. Thus half a pound of powdered sulphate of copper is mixed up with 100 lbs. of hot water and if 8 ounces of powdered white arsenic with 1 lb. of lime are added to the vat containing the sulphate of copper solution, the sugarcane cuttings can be dipped in this insecticidal and fungicidal mixture, immediately before planting, but the cuttings after being dipped in this liquid mixture should have a coating of powdered castor-cake (100 lbs.), ashes (2 lbs.) and soot (1 lb.), that the growth of the young plant may be helped by these manurial substances. If sulphate of copper is not available 1 lb. of alum may be used in place of ½ lb. of sulphate of copper for making the fungicidal solution. Half an ounce of asafoetida may be mixed with every 100 lbs. of the fungicidal solution, as the strong smell of asafoetida keeps out most insects. The mixture should be used up the same day that it is made. The quantities mentioned will suffice for pickling cuttings required for 1 acre of land.

### ROTATION

Except in the case of a ratooned variety, sugarcane should not be grown on the same land more than once in 3 years. It is best to grow sugarcane after a preparatory crop of Dhaincha, sunn-hemp, or barbate (vigna catiang), cut down when in flower, in August. A crop of potatoes may be grown from October to February, and the land immediately afterwards get ready for planting sugarcane in February.

### MANURING

Sugarcane responds were to a heavy outlay on manures. The following mixtures may be recommended :—

| | | | | |
|---|---|---|---|---|
| (1) | Bone-meal -- | 10 | maunds per acre | applied before sowing. |
| | Castor-cake -- | 30 | " " " | applied after sowing, in two doses. |
| (2) | Cowdung -- | 600 | " " " | ploughed in before trenching. |
| | Bone-meal -- | 10 | " " " | before sowing. |
| (3) | Poudrette -- | 350 | " " " | before sowing. |
| (4) | Powdered apatite | 6 | " " " | applied before sowing. |
| | Castor-cake -- | 20 | " " " | applied after sowing in two doses, |
| | Saltpetre -- | 2 | " " " | applied in two doses after the plants are a foot high, but before June. |
| (5) | Castor cake -- | 35 | " " " | applied in two doses before the two earthings. |
| (6) | Fish manure -- | 30 | " " " | after sowing. |
| (7) | Safflower cake -- | 30 | " " " | before and after sowing. |
| (8) | Rape cake -- | 50 | " " " | before and after sowing. |
| (9) | Superphosphate of lime -- | 5 | " " " | A handful being put under each plant when about 1 ft. high. |
| | Sulphate of ammonia -- | 1½ | " " " | |
| | Sulphate of potash | 1½ | " " " | |

#### AFTER-CULTIVATION

The after-cultivation of the sugarcane [crops] consists of :

7 Hoeings with kodali, March to June.
[3] Weedings, April, May and June.
1 Levelling with kodali in June and
10 Irrigations (1 in December, 1 in March, 2 in April, 3 in May, 1 in June and 2 in November).

#### HARVESTING

When there is little moisture in the [soil and] when the top leaves have begun [to wither], the canes should be considered [ready for] cutting. The cultivator may also [test] the sweetness of the juice. If too [much time] is wanted in judging whether [they] are quite ready for cutting or not, [excessively] hot and dry weather may [set in] during the progress of the harvest [operations], and then the yield of juice will [be reduced]. The canes are cut close to the [ground]. If stumps are allowed to be kept [in] the ground, poor shoots will come out [which] yield a poor return next year.

## TOBACCO

In treating of tobacco it is not sufficient to restrict oneself to the question of manuring, for so much depends upon the soil in producing tobaccos of different market values, and the price rests still more on the treatment of the leaf after the harvesting.

#### SOIL

A light soil or sandy loam, well drained, containing an average amount of organic matter and rich in mineral matters is considered to be best suited for tobacco cultivation. Grown on clay soils, the leaf becomes too coarse and inferior in quality, but clay soils usually give heavier yields. Sandy loams, rich in organic matter, produce a better sort of tobacco of the kind fit for making cigars.

Tobacco is sometimes grown after jute or maize has been harvested, but very often it forms the only crop of the year. Properly manured, it can be grown for 3 or 4 years successively on the same ground.

### SEED-BED

The soil of the seed-bed is dug up with a spade and manured with rotten cowdung and ashes and then raised about six inches. When the ground has been well pulverised and levelled, seed is drilled thin, so that the seedling may have about one inch of space around it. After sowing, the seed is lightly covered up with earth. The seed-bed is kept covered with mats until germination takes place. Seed is generally sown in the first week of September or earlier in Bihar and Chota Nagpur. In dry laterite soil it is best to do the sowing early, i.e., about the second or third week of August. Half an ounce (1-1/6 tola) of seed is to be sown to produce plants required for one acre; but loss invariably occurs owing to patches of seedlings growing too thick. It is therefore advisable to grow seedlings from one ounce of seed for one acre of land.

### PREPARATION OF SOIL

The soil for tobacco-planting should be prepared during the months of September and October. Eight to ten ploughings are necessary. Deep cultivation and thorough pulverisation of the soil are most important. The soil should be liberally manured with well-rotted cowdung and ashes. It is then to be levelled with a light harrow. It is needless to say that even poor soil can be made to produce a good crop by proper tillage and heavy manuring. Soils destitute of potash, unmanured soils, or soils manured with flesh, bones, calcium chloride, magnesium chloride, or potassium chloride, produce a bad burning tobacco which is unsuitable for making cigars. The use of cowdung also should be avoided in raising tobacco for the manufacture of cigars. Potassium carbonate, saltpetre, potassium sulphate, and calcium sulphate (gypsum) are the best manures for tobacco intended for cigars. They give to the leaves a sweet flavour and burning quality. Gypsum is excellent as a top-dressing and its use is particularly recommended to Indian cultivators. Crops manured with it suffer less from the effects of drought and require less irrigation.

### TRANSPLATING

When the seedlings are about three inches high in the nursery, that is, after they have shown three or four leaves which takes place within six weeks from sowing time, they are fit for transplantation. The transplantation begins in the beginning of Aswin (the third week of September), and extends as late as the end of Kartik (middle of November). Early planting is preferable, especially for dry climates. The seedlings should be planted in the evening, three feet apart from one another.

### AFTER-TREATMENT

A few days before the plants run to flower, their buds and lower leaves should be nipped off, and they should be so pruned that only eight leaves, and on no account more than ten, may be left to each plant from the top. Plants reserved for seeding should not be topped in this way but left to flower and seed. The plants always bring forth shoots by the side of the stalks of leaves pruned, and care should be taken to prune off the shoots every now and again until the leaves are mature. The longer these buds and shoots are kept the more injury is done to the leaves required to be gathered.

### HARVESTING

When the leaves feel thick and gummy and begin to turn yellow with brown spots they are considered mature and they should be cut off. Tobacco should not be cut over-ripe. Harvesting of a plot should not be done at once; the mature plants are to be gathered first. The best time for harvesting is morning as soon as the dew is off plants. They should lie for some time in the sun, say for two hours, to make them sufficiently wilted, so that they can be handled without breaking. Care should be taken not to let them become too much sun-burnt. It is better to cut whole plants (close to the roots) than gather the leaves singly. Harvesting should be delayed for two or three days if there be heavy rainfall, which washes away the gummy matter of the leaves.

### DRYING AND FERMENTING

Immediately after the plants are conveyed to the house, they should be hung up on strings beneath the roof of a well-ventilated house, six inches apart. Cow-sheds are commonly used by the raiyats

this purpose, but this gives a bad ... to the tobacco. The plants should ... hanging for more than two months, ... they are quite dry. When very ... strong winds blow, the windows ... of the house should be closed. ... dry weather, the floor of the shed ... be occasionally sprinkled with ... in order to keep the air of the room ... moist.

... drying and fermenting the to... ...ves are cured. This may be car... ... accordance with the uses of the

## COTTON

... cultivated plants are so under... have been half so much confused ... conflicting opinions regarding the ... forms as the cottons. Practically ... botanical names in current use were ... cultivated plants, and these ... subsequently, and in some cases ... that they are now mostly unre... ... Instead of rejecting a nomen... ... hopelessly useless, one bota... ... another has given his peculiar ... re-assorted the published names. ... duty of establishing species on ... forms and grouping the cultivated ... clear as may be possible under ... been absolutely neglected and ... of the genus become confu... ... confounded. Useless contro... have engaged attention, such as ... there are fifty or more species, or ... or even only one in the whole ... further, whether a single charac... supreme value can be discovered, ... a classification of the forms ... based. The early authors divid... ...ns into trees and bushes, or into ... and annuals. It has now been ... beyond dispute that all species ... under suitable environment ... if left alone, and may in time ... bushes or even small trees. ... when cultivated they readily re... environment, and when necessity ... annuals or otherwise adapt ... On dry stony soils they are ... perennials, on rich loamy soils an... ... especially if restrained by cold ... winter months or by a heavy perio... ...(monsoonic) rainfall or by infestations

The general method of cultivation of cotton as given by Mallison is as follows:--

### SOILS

The crop thrives best on fairly deep black soil, with a rainfall of 30 to 40 inches, and it is grown entirely as a dry crop. The most suitable soil is the so-called "black cotton soil" which may be found in some parts to a depth of five feet or more as in Ahmedabad, Broach and Surat; but cotton also succeeds on much shallower soils.

### ROTATION

Generally the crop is grown alone, but where the rainfall is heavy and the soil retentive as in Broach, rice in the same or in separate rows is often subordinate to it. Coriander, sesamum, gram (Cicer arietinum) are sometimes sown to fill vacancies. The roji cotton of Kaira, etc. is, on sandy loam soils, always grown as a row crop with bajri (Pennisetum typhoideum) or pulses. The principal rotation crop with cotton is juar (Sorghum vulgare), but this may be modified according to district and season. Thus wheat is extensively grown as a dry rabi crop on the cotton soils of Ahmedabad, lang (Lathyrus sativus) and a mixed crop of tuver (Cajanus indicus) and sesamum as rabi crop in Broach, etc.

### TILLAGE

Preparatory tilling begins usually in the hot weather by collecting and burning the stubble of the previous crop. Two ploughings and two more harrowings may be required before the seed is sown, but the amount of preparatory tillage necessary depends on the previous crop.

### SEED

The seeds require special preparation for sowing, as they generally cling together, owing to the lint and fuzz which may still adhere to them. This is accomplished by mixing them with a thin plaster of cowdung, mud and water, and rubbing the plastered seed on the close network of an indigenous bedstead. The seeds can then be passed through the seed-bowls and tubes of an ordinary country seed-drill. If sown alone the seed is drilled in rows 22 to 26 inches apart. About 15 lbs.

per acre is the usual seed rate. Two harrows follow one drill to cover the seed and smooth the surface. If the seedlings are damaged before they produced true leaves, the crop should be resown, if the season has not too far advanced.

When the seedlings are about 4 inches high, the crop is ordinarily intercultured with the bullock hoe and hand-weeded. The weakings are then thinned out and the plants left about 18 inches to 2 feet apart, if in good condition, but if backward or stunted they are left closer together. The plough is finally passed between the rows in September or October.

### CROP

Flowering begins in October-November, and may last till January if the rains are late and favourable. Picking usually commences in January and lasts till March or April. The crop is picked at short intervals, as the cultivators are afraid of their fields being robbed at night. The best time for picking is the morning, as the lint is then clean, owing to the dew on the foliage.

### MODIFICATION ON ABOVE SYSTEM

In Surat the average rainfall is slightly heavier than in Broach, but the soil is not so deep nor so dense, and there is less risk of seedlings being destroyed by rain. The rotation crops are mostly kharif, whereas in Broach they are rabi. Juar is the principal rotation crop, always with a subordinate mixture of white tuber. Rice is never sown with cotton in Surat.

The principal variation in cultivation in the Karnatak is due to the monsoons—the south-west between June and October, and the north-east between October and December. If sowing were to take place in June, as in other districts, the Dharwar crop would ripen in the middle of the north-east monsoon and the cotton be damaged by rain. To prevent this, sowing usually takes place in the latter part of August, and may be even extended to September. The seedlings are not thinned out to the same extent as in Broach and Surat, but are left comparatively close together.

In Khandesh two forms of cotton are grown, the one on black and the other on light soil; they generally occupy the same field once in three years. The light-soil crop yields best with heavy rainfall, the black-soil crop with moderate rainfall. The seed rate is 10 to 12 lbs. per acre and is sown, if possible, by June. Picking begins in October and is complete in December. In cotton-picking, care should be taken to avoid floss which is discoloured and damaged by boll-worm, as such obtains a poorer price and its presence lowers the average rate obtained.

In selecting seed for next [illegible] should be taken to secure bolls [illegible] largest, healthiest and most [illegible] fruiting plants. Seed should not be taken from plants on which any of the [illegible] affected by boll-worm. As a fur[illegible] caution against boll-worm, cot[illegible] should, before it is prepared for s[illegible] steeped for five minutes in a [illegible] solution of copper sulphate and [illegible] in the sun. Disastrous effects [illegible] cotton crop may be produced by [illegible] mospheric disturbances. The m[illegible] consequences are due to heavy rai[illegible] quent changes of wind, cloudy we[illegible] frost.

## POTATO

The great importance of the [illegible] as a human food in all the [illegible] having temperate climates [illegible] more fully appreciated than ev[illegible] The role that this crop played in the [illegible] Great War especially in Germany [illegible] tria, may never be fully realized [illegible] these two countries themselves. [illegible] ly, crop of such great economic in[illegible] as the potato, and one having s[illegible] adaptation to the soil and clima[illegible] tions, involves many problems [illegible] many enemies in the shape of i[illegible] fungus pests with which to cont[illegible]

In this article it is our aim [illegible] the basic principles underlying th[illegible] tion of potatoes.

### ROTATION

Potato is usually cultivated [illegible] Bengal after jute, or maize, or Aus pa[illegible] tracts of country where the pot[illegible] is the principal crop, it often forms the [illegible] of the year. In parts of Bih[illegible] in the plains of Northern India, and in K[illegible] hills two crops of potatoes are taken from the same land in one year. There is a comm[illegible]

tion in this country that potatoes do well ow on the same land year after year. ie texture of the soil is no doubt render- fitter and fitter for the potato crops by e cultivation operations done for this op, but insect and fungus pests predo- nating prove the injuriousness of this stem after a few years. It is best to w sann-hemp, between June and August d plough the crop in August or Septem- r. The green manuring adds consider- ly to the growth of potatoes. Lime and d fresh ashes should be used if green anuring is done to hasten the decomposi- n of the manure and prevent insect- sts

### VARIETIES

There are several varieties of potatoes own in different parts of India. The tna variety with red skin gives a better ld than the Nainital variety, and the ptl[illegible]ing of the Patnai potatoes would an improvement. A Madras variety is s[illegible] prolific, but it does not keep so ll as the Patnai or the Deshi.

### SOIL

The most suitable soil for the cultiva- n of potato is the sandy loam of a fine ture but not clay loam. Such soil, if ntains a good deal of humus matter, hich makes it retentive of moisture, is st suited for the crop. Shallow, sandy [illegible] soils and heavy clay soils, are not itable for potatoes. Sandy soils improv- l by the admixture of pond or river silt swers very well.

### PREPARATION OF THE SOIL

In the cultivation of potato deep [illegible] and thorough pulverizing of the [illegible] essential. Two ploughings and [illegible] ploughings with an improved [illegible] followed by one grubbing with a [illegible] grubber and one cross-grubbing [illegible] done as soon as the rainy season [illegible] the 3 series of operations being [illegible] at intervals of one week between [illegible]tions. Then should follow one or [illegible] harrowings for collecting weeds. [illegible] harrowing the land it should be [illegible] seed bed level by means of lad- er. The land is next prepared for irriga- on before sowing is done, as the making f irrigation channels after sowing uproots number of seed-tubers. The field is first divided from its head, or main channel for irrigation, to its bottom, into a number of long strips 6 ft. wide, separated by water-channels about a foot wide, leading from the main channel at the head of the field to the bottom. The strip of land 6 ft. wide should then be divided into ridges and fur- rows 18 inches from one another. The ridges should be made in such a manner that they are at right angles to the main irrigation channel.

### HOEING

Along these ridges 6 ft. long and 18 inches wide, potatoes should be planted in double rows 6 inches apart during Septem- ber and October, 6 inches from one another and 4 inches deep. This is a tedious opera- tion, one man makes a straight channel 4 to 5 inches deep with a narrow spade along each furrow and between two adjacent ridges. Another man then puts in two rows of pickled potatoes 6 inches apart both ways, and covers up the channel as he goes on, following the man who is making the channel, while a third man goes on putting manure along the covered chan- nels only. Instead of spreading the manure all over the field this will be found a more economical way of using the manure.

### MANURING

As potatoes are benefitted by high manuring, good manure may be used. One of the following manures is recommended for use:

I.

| | |
|---|---|
| Bone meal | 6 mds. |
| Castor cake (powdered) | 18 „ |

The mixture is sufficient for manuring 1 acre of land. It may be applied imme- diately after planting.

II.

| | |
|---|---|
| Rotten cowdung | 100 mds. |
| Ashes or lime | 15 „ |
| Castor cake | 15 „ |

In this preparation rotten cowdung must be applied before planting to ensure better yield. The remaining two sub- stances are mixed together and applied after planting.

### IRRIGATION

Whether the plants all come out with- in a fortnight or not, the first watering

should take place within 10 days to a fortnight after planting, unless a good shower of rain makes this watering superfluous. The tardy sprouts will come up after the watering. If seed-potatoes are kept indoors under a heap of most straw or over damp sand for a week or ten days before planting, the sprouting will be quicker and more even after planting. Instead of flooding the field or running the water along the channels in which the seed potatoes are imbedded, it is best to run the water along channels between the rows of potatoes, or to distribute the water from the channel by means of an irrigation spoon. This prevents caking of the soil. But if the water run, along the channels in which the potatoes are imbedded hoeing should be done within a week after the irrigation to allow the sprouts to come up without resistance. The first earthing up should take place when the plants are 6 to 9 inches high. Then should follow two waterings at the interval of a fortnight and then the second earthing. If the soil looks dry, irrigation should take place before and after the two earthings at shorter intervals, say, once in 10 days. Three to six irrigations are necessary, according to the nature of the locality and of the season.

#### LIFTING

When the leaves and haulms are dried up completely and the land becomes quite dry, the potatoes are ready for lifting. Usually it takes three months to get matured potatoes for harvesting. This lifting is best done with the Hunter hoe unless a potato-digging plough is employed. Perhaps a slightly larger proportion of tubers gets cut when the hoe is used than when spades are used. 100 maunds to 150 maunds per acre is a fair outturn, though as much as 300 maunds per acre are sometimes obtained.

#### PRESERVATION OF SEEDS

It is difficult to preserve the seed of the superior and large sized hill potatoes in the plains, and one of the chief obstacles to the spread of the cultivation of the Nainital potatoes has been the high price that has to be paid for the imported seed at the time of sowing. If each cultivator could store his own Nainital potato-seed there would be no occasion to grow the inferior Deshi varieties. The following plan as given by N. G. Mukherjee in his "Handb on Agriculture" may be tried.

In a dark but well ventilat[illegible] erect shelves in which sand is to b[illegible] and potatoes spread one deep [illegible] shelves. Ten or twelve shelves [illegible] arranged one above another on [illegible] All rotten potatoes must be weede[illegible] the seed-godown examined const[illegible] this purpose. Small sized potat[illegible] better and those that come from [illegible] surface of the ground. Only [illegible] places are suitable for preser[illegible] seeds.

## BRINJAL

Next to potato brinjal is [illegible] highly prized vegetable. It is e[illegible] grown throughout India and othe[illegible] countries for its fruit which wh[illegible] and dressed in various ways, form[illegible] palatable vegetable.

#### VARIETIES

There are numerous varieti[illegible] ent chiefly in shape, size, and col[illegible] fruit. One variety has a scarle[illegible] the same size and shape as the f[illegible] large red tomato; another has a [illegible] egg shaped fruit, but these two [illegible] dered more ornamental than usef[illegible] the fruit of the latter is someti[illegible] The varieties which are most e[illegible] vegetables have dark or light p[illegible] and are either quite round or [illegible] in shape.

#### SOIL

High, well drained sandy [illegible] garden soil rot too rich in orga[illegible] suits this crop best. In clay[illegible] fruits become small though sw[illegible] excess of organic, or nitrogeno[illegible] present in the soil, gives rise t[illegible] lopment of leaves at the expens[illegible] It is an experimental fact that [illegible] plots give better result than plo[illegible] with saltpetre and cowdung. [illegible] subject to diseases and attack o[illegible] should not be grown in the sa[illegible] every year, and the land should be [illegible] drained, as stagnant water gi[illegible] fungoid diseases. The free use [illegible] ashes at the time of sowing [illegible] trans- planting is also recommended and [illegible] and protected cultivation befor[illegible] planting

## SELECTION OF SEED

The selection of good and matured s should be selected in order to get a crop. The seeds should be secured from a nursery or from seeds stored previous crop. The latter method best, of course. In the previous cul- on when the biggest first fruits are golden yellow in colour they are from the plants and cut right the In this state they are kept in a two days. The seeds are then lected, washed clean in water and the sun and kept up for the next

## SOWING

preparation of soil is absolutely before sowing the seeds. The ll pulverised with the kodali and and well rotted manure mixed and ashes applied. This should n January or February, while the should be deferred till the end of still later, the usual time of sow- eed in Lower Bengal being early Thorough watering of the soil ake place before sowing is done. shower of rain or watering of the rinkling, seed is sown evenly and hickly in a seed-bed, which should in a cool and shady place. After hand is lightly rubbed over the ive the seed a covering. Every cept when there is rain, the seed- uld have a light sprinkling of If the seed-bed is in shade well- from the sun, no other protec- be required, otherwise the bed covered with palm or plantain grass thatch until the germina- place in three or four days. ering should be continued every ter germination also. If a heavy rain takes place the seed-bed carefully drained of standing insect pests appear, ashes and be dusted on the plants.

Begun (solanum longum) seed is September and October, the seed transplanted in October and Nov- they bear from February to From May to August the ordinary plants may be made to bear fruits that show signs of decay by February or March are pruned, manured with mustard cake and ashes and watered. Fresh shoots will be thrown out, and fruits of a somewhat inferior quality will be borne.

In Northern India, however, three sowings of this crop are usually made in the course of a year. The first is made towards the end of October, broadcast in beds, and the beds, and the young plants allowed to remain in the latter under a covering of grass thatch raised about 20 inches above the beds until the advent of mild spring weather. As soon as all danger from the occurrence of frosts, or about the middle of February, the young plants are transplanted.

The next sowing is made in beds as before during the spring months, or any time between the middle of February and end of March, and the plants, when large enough to handle, are transplanted as before.

The third sowing is made early in the rains and given the same treatment as the others. This sowing begins bearing towards the close of the rains.

## TRANSPLANTING

The field where seedlings are transplanted should be also prepared very early in the season. This should be done with a kodali or with an improved plough and grubber. The grubber should be passed afterwards once a month until planting. By the middle of May the land should be levelled and got ready for planting. Drains are made all round the field and a few water channels running through the field. Then furrows are made 36 inches apart and the young seedlings planted along the middle of the July after a heavy shower of rain. If planting is done in April or May transplanting the seedling may be done on the level plot 36 inches apart instead of in furrows; and the water channels are made afterwards. Mustard-cake and ashes and lime should be applied finely powdered under each plant at the time of transplanting. Cowdung and castor-cake encourage the growth of vegetation at the expense of flowering and fruiting; and 6 maunds of mustard cake and 3 maunds of ashes and 1 maund of lime are a sufficient application for one acre. In a fortnight

or ten days the kodali should be passed between the rows of plants, thus levelling the field. Blanks should be filled up at this time. After another fortnight the kodali should be passed once more between the rows of plants covering the furrows into ridges. Irrigation may or may not be necessary according to the character of the season and the time of planting. If planting is done after a heavy shower of rains in June, irrigation will not be generally necessary till November; but if it is done in April or May, irrigation will be necessary at least once to save the crop from drought. From November to March irrigate once a month. The fruits will begin to bear in August; kuli begins to bear fruits from February to June; while the ordinary variety may be made to bear fruits from May to August. Thus brinjals are available throughout the year.

#### DISEASES OF THE PLANTS

Brinjal plants are liable to be attacked with the fungoid diseases, namely Dhashalaga and Tulshimara. These are due to the overlook of cultivators for not cutting off the tap-root at the time of transplanting and also to the roots getting cut at the time of earthing. These are fictitious causes. Root-cutting has something to do, no doubt, with the vigour of plants; and cutting of the roots when there is water-logging may indirectly cause spores of fungi to settle in the tissue of the plants. Water-logging helps the spread of the bacillus. Every plant affected with a fungoid disease must be uprooted and burnt. The seed should be pickled, and the same locality always avoided for growing this crop from year to year.

## PALWAL OR PATAL

This is a climbing or trailing perennial with annual stems, and is extensively cultivated in the warmer parts of India. Although found in a wild state in the Northern Provinces, the cultivated form is by no means a common plant in these districts. Like others of its tribe, it is grown for its fruit, which, when in an immature state, is much esteemed as an ingredient in vegetable curries. The fruit is about 4 inches long, pointed at both ends and swollen in the middle, when young, pale green, and when ripe, changing to a deep orange colour.

The seeds are usually sown in a lig[illegible] well-drained soil in patches at 3 feet apa[illegible] from May to the middle of July, and t[illegible] stems allowed to trail over the grou[illegible] without support. It is also trailed [illegible] trees, and grown in hedges whe[illegible] stems can find support ; but it is belie[illegible] to fruit more profusely when gro[illegible] the ground. Like all rainy season cro[illegible] it flourishes under the wet conditions [illegible] whether then usually prevalent, but at [illegible] same time it dislikes stagnant mois[illegible] the roots. When selecting a spot [illegible] cultivation, a high well-drained [illegible] should always be chosen.

When grown at low elevations [illegible] hills, sow at the same time and [illegible] after-treatment as described for the [illegible]

## CAULIFLOWER

This popular vegetable is [illegible] known to call for any description [illegible] the most esteemed of the varie[illegible] which have sprung from Brassica [illegible] There are numerous varieties [illegible] seed lists, most of which readily [illegible] tised in India. They change chara[illegible] certain extent, but show little dege[illegible] except when sown late in the seas[illegible] warm forcing climate of this [illegible] causes cauliflower to assume an ea[illegible] quicker maturing habit than it [illegible] when newly received from Euro[illegible] other words, it is transformed [illegible] temperate to a semi-tropical plant [illegible] to be treated as such. If accl[illegible] seeds are sown in Northern Indi[illegible] the months of June, July and Au[illegible] plants produce most excellent he[illegible] if seed from the selfsame stock [illegible] later on, or in September and Oct[illegible] plants shoot up into flower with[illegible] ing heads, greatly to the annoy[illegible] disappointment of the grower. If [illegible] seeds are sown during the same [illegible] have been named for sowing acc[illegible] stock, the seeds often fail to [illegible] and when they do come up, the [illegible] are very apt to die off owing to [illegible] and excessive moisture then [illegible] In order to have a long successi[illegible] good plan to make use of both [illegible] seed, i.e., acclimatised for early or [illegible] sowing, and imported for late or [illegible] sowing.

As the **young plants are rather more** licate than **is the case with other** mbers of the **Brassica family, the seed**-ds require **more careful preparation, and** seedlings **more after-attention than is** eded by other **members of that tribe.**

Th[illegible] beds should be prepared before the ins begin in an open, sunny situation, and uld be about 5 feet by 5 feet for ery ounce of seed sown. For all early wings they should be raised fully a foot ove the surrounding surface in order to ure good drainage, but for sowings made ter the rains are over, they may be pre-red on the level ground. The soil ould be friable and fairly rich, but not ghly manured. We find old potting [illegible] and some well decayed leaf-mould, [illegible] in a few inches deep over the sur-[illegible] of the beds, to be the best manure [illegible] can be given. After completing [illegible] arrangements the seed should be [illegible] broadcast, and covered over with ¼ [illegible] light, finely-sifted soil. If the [illegible] is dry at the time, water imme-[illegible] after sowing with a fine-rosed [illegible] pot, but if the rains are then in [illegible] withhold water except during the [illegible] of a long dry break. The seeds [illegible] never be sown when the soil is in a [illegible] condition. It is, of course, [illegible] impossible to prepare a dry seed-[illegible] during the rains, but if the beds are [illegible] before the rains begin, as already [illegible] recommended, one day of bright subshine [illegible] then dry the soil just to the condition [illegible] in for the reception of seed.

Shade should be given to all sowings [illegible] hours during the hottest part of [illegible] day and withdrawn when the seedlings [illegible] week old. Early sowings may, [illegible] be protected with advantage with [illegible] material during the occurrence [illegible] rain, but the covering should not [illegible] the plants an hour longer than [illegible] necessary, or they will grow [illegible] leggy, and in a generally unfit [illegible] for transference to the open [illegible].

[illegible] sowings, or those made in June [illegible] are all the better for being once [illegible] before being finally planted to [illegible] permanent quarters in the ground. [illegible] plants of these sowings should [illegible] be carefully taken up from the seed-bed, and pricked out in new beds, made up as before, in lines 3 inches apart and 2 inches from plant to plant. If this plan is followed, the plants will be found to be much sturdier and hardier when the season for planting arrives, than if they had allowed to grow on in the seed-beds.

The ground for the ultimate reception of the plants should be prepared in the same manner as recommended for cabbage, and plants put out in row 2½ feet apart and 2 feet from plant to plant. These distances will answer for all varieties excepting Veitch's Autumn Giant. This being a larger growing variety than any of the others, it requires the rows placed at 3 feet apart and 2½ feet from plant to plant. All after-cultivation is exactly the same as has been recommended for cabbage.

Cauliflower is subject to the attacks of several insect enemies. When in the seed-bed, a small dark green caterpillar is sometimes very destructive to the young plants. When it is present, the leaves should be dusted over every second or third day with the ash of cowdung or gently sprayed with a weak solution of phenyle. If the latter is used, a teaspoonful of the fluid should be allowed to every gallon of water. After the plants have been put out in the ground, and up to the time that the heads are ready for cutting, few insects seem to trouble them, but if a few are grown on for seeding purposes, these often get attacked just before or soon after coming into flower by Aphis or green fly. Frequent syringings with a solution of phenyle, double the strength of that recommended for the plants when young, will soon exterminate this pest. After the plants have formed their seed pods they are sometimes troubled with a small greyish bug. This insect has a habit of dropping to the ground when disturbed ; therefore, the best plan to get rid of it is to spread a cloth below the plants and gently shake them, then gather up and crush the insects that have fallen.

The treatment required at hill stations is similar as recommended for the plains. Imported seed only should, however, be used, as acclimatised stock seldom gives good results in the hills. The seeds should be sown in spring or in autumn in a warm sunny situation. When the weather is

severe, autumn sowings should be protected with matting or dry grass, but protection must not be overdone, or the plants will be weak and leggy when the season for planting arrives. In the lower elevations early autumn only should be made.

## CABBAGE

Cabbage is one of the most popular of vegetables. There are innumerable varieties of four classes, Dwarf Early Whites, Dwarf Savoys, Large Late Drumheads and Red Pickling Cabbage.

The seeds should be sown broadcast in beds and covered over with about ⅛ inch of fine soil, from the middle of August to the end of October. The beds should be made in an open situation on moderately rich soil, and should possess a surface area of 25 square feet for every ounce of seed sown. If the soil is moist at sowing time, no water need be given until the plants appear, but if it is dry, water should be at once given from a fine rosed watering pot, and the supply repeated whenever necessary. Shade should be afforded for a few hours during the hottest part of the day immediately after sowing, and for a few days after the young plants appear, but care should be taken not to overshade, or the plants will be drawn up into a weak, leggy, and generally unfit condition for transference to their permanent quarters in the open ground.

As early sowings are apt to be destroyed by heat and excessive moisture, only small chance sowings should be made in August and during the early part of September. The main sowings may be made after the middle of the last named month or during October. When the young plants are 4 or 5 inches high they should be planted out in ground prepared as follows :—

Overspread the surface to a depth of 4 or 5 inches with decomposed manure of the farm-yard class a month or six weeks before planting is required to be done, and dig over to a depth of 15 or 18 inches, thoroughly incorporating the manure with the soil during the operation. After the surface has been pulverised and levelled, lay the ground out in drills, 4 inches wide, 3 inches deep, and 18 inches apart, and insert the plants down one side of the drills at 18 inches as under. These distances are sufficient for all classes of cabb[age ex-] cepting the large growing Dru[mheads.] For the latter, allow 3 feet fron[m drill to] drill, and 2 feet from plant [to plant.] Water immediately after plant[ing, and] repeat the supply about once a we[ek if] the weather is dry. Weed when [necessary] and occasionally stir the soil bet[ween the] rows with a fork. When the p[lants are] rather more than half grown, ear[th should] be drawn from the spaces bet[ween the] rows up to the base of the stem[s. When] this operation has been accompl[ished, the] plants should appear as if planted [in ridges] from 6 to 8 inches high. A[fter] attention consists in keeping d[own] weeds and flooding the furrows [between] the ridges once a week as before [if the] weather is dry.

Small heads of the Drumhea[d] cabbage may be had in season in [the hills] in Northern India up to the en[d of ...] In order to secure this result, [seed] should be sown about the be[ginning of] December, and the young plants [planted out] in January at the distances a[s given] for the Dwarf Early Whites.

The cabbage is not so lia[ble to the] attacks of insects in this coun[try as in] Europe, but during some seasons [a kind] of caterpillar appears. When it [appears] the only successful remedy for [its destruc-] tion is hand picking until exter[minated.]

The mode of cultivation req[uired in the] hills is the same as detailed fo[r the plains.] For gardens situated below 5,0[00 feet alti-] tude autumn sowings are re[commended.] Crops from spring sown seed [are invari-] ably destroyed by numerous [in-] sects and caterpillars.

When it is desired to hav[e cabbages] to use during the early summ[er months,] the seeds should be sown i[n the] autumn, and the young plan[ts set out] from these to the open groun[d.] Spring sowings will not produ[ce heads fit] to use until late in summer, or [in the] early winter months. In order [therefore] to have a continuous suppl[y, sowings] should be made at both season[s.]

## PEAS

There is no vegetable of [which the] seedman's list contains so ma[ny varie-] [ties] as of the Pea or Mutter (Pisu[m sativum).] Every year new varieties are ad[ded]

en several however, scarcely any ... e exists but in name, and a selec- f three, or at the most four, will be it may by any possibility be needed Indian garden. Seed dealers are ... able to advise regarding useful ...es.

## SOIL

...ugh peas are grown on all wet ...er tanks and wells, they seem ...e best on rich light clayey loams ...d mostly from wells. The plant ... withstand water-logging in the

## SEASON

...he peas do not stand in long ... rain they are usually planted ...s the end of the rainy season and ...ginning of winter. In districts of ... inches rainfall or under, there is ...tion to sowing them at the beginn- ...the rains.

## PREPARATION OF THE SOIL

...e land is usually ploughed twice ...the mould-board or country ploughs. ...ould-board ploughs are used in great ...s in these parts. Ploughings are ...er good rains or by irrigationing ...ells or tanks. If the land is very ...n after the harvest of paddy, it ...lled roughly at least on blocks of ... or one-eighth of an acre. The ... are opened with the Kodali ... Three or four such blocks ... an individual generally plants ... with peas, as otherwise it will ... for him to properly attend to ... irrigating the crop. Some- ... furrows are opened with a ...plough. The furrows are made ... deep and half foot wide into ... lengths of 10 to 15 feet at the ...ich runs the water channel. A ... four to six feet is allowed ... about in between them for ... plants, hoeing and picking of ... other operations. The growth of ...ld be better and more vigorous ... which are prepared some time, ...month, before sowing than in lands ... immediately before sowing.

## PRECAUTION IN SOWING

Cool winds seem to favour the natural growth of the plant besides warding off the terrible diseases mildew — which attacks peas. With the object of aiding good circulation of the cool breeze usually coming from either west or east, peas are always sown in rows running east to west.

## MANURING

A mixture of cattle manures and fresh earth at the rate of 5 to 10 cart-loads per acre respectively is then worked into the furrows. The application of fresh earth is sometimes dropped in which case the dose of cattle manure is increased by four or five carts, if not doubled. According to Firminger's Manual of Gardening manuring should be done by digging the soil to a depth of one foot and enriching with manure at the rate of 10 lbs. farmyard manure and four ounces bone meal per square yard.

## CULTIVATION

Seeds are dibbled by hand 2″ to 3″ deep and ½ to ¾″ apart in the furrow at the rate of twenty-five to thirty seers (Mysore) per acre, preferably in dry soil. This works out at eighteen to thirty seeds for the length of a foot. Wrinkled seeds or immature greenish coloured ones are rejected and only whitish coloured good seeds are selected for sowing. Seed meant for sowing purposes are generally dried well previous to sowing and sprinkled with lime dust.

Various insects, birds and other animals are found on the seeds and seedlings. To protect the seed it is recommended to shake it up in a vessel with sweet oil and then transfer the oily seeds to a vessel containing a little red lead where they are shaken to make the poisonous powder adhere to them. A boy should be set on guard over the pea plot till the plants are well above ground, say six inches tall. If there is no rain, water should be given once in eight days till flowering once in four days when the pods are forming and swelling, and gradually reduced thereafter.

## AFTER-CULTIVATION

Germination takes place in 5 days after dibbling. After the plants have come

up they are hand watered for three to four weeks as follows :—

Once daily during the first week : 7 to 8 waterings.

Once in two days during the second week : 3 to 4 waterings.

Once in three days during the third and fourth weeks : 5 to 6 waterings.

When the plants are about 9 to 10 inches high, they are staked, usually with lantana stems which are got from the waste lands or hedges. Nearly five to six cart-loads of lantana stems would be required to provide stakes for an acre of peas. These stakes are not as durable as bamboo branches used in some rare instances.

While staking, the crop is earthed up and the irrigation channels are deepened. Then follows irrigation of the crop from a well or a tank whichever may be the source of water supply. At the beginning olny light irrigations are given and if the rains fall in the meantime no irrigation is given at all for fear of water-logging. Later on, copious watering is given at each irrigation and the number of irrigations also, in case no rains are received, is increased. Sometimes two irrigations are given daily when the picking of pods has begun. Some thirty to thirty-five irrigations are found necessary for a summer crop.

### HARVESTING

The plants flower in about 32 days and the first set pods are ready for picking in about 55 days after planting. Then there are about eight to ten more pickings at an interval of four to five days between one picking and the other. Usually the latter pickings are bigger than the first one and the last picking is equal to the first picking. The pods are cut off with scissors, usually hand-picked, by a batch of two coolies per row, going simultaneously on both sides of it.

For seed purposes, pods enough to give them the required quantity of seeds are not picked, allowed to ripen and dry on the plants. These dry pods are not picked separately but the entire plant is pulled off the ground. Both the plants and pods are further dried in the yard and thrashed with a stick when the seeds separated easily from the pods and are gathered, cleaned by winnowing and st[ored] after drying thoroughly for a coupl[e of] days.

### YIELD

1,500 to 2,500 lbs. of green pods [and] 70 to 100 lbs. of dry seeds are the [usual] outturn per acre. As in the case [of] potato, one can never be sure of a [good] good pea crop.

## TOMATO

Tomato plant or lycopersicum es[culen]tum is a succulent annual, said to [be a] native of South America and [is] cultivated for its fruit which, when [ripe] is much esteemed in salads, for ma[king] sauces and for flavouring soups, etc.

### CULTIVATION

In order to cultivate tomatoes selected seeds are scattered over the bed made up in the open situ[ation] the middle of July to the end of [Oct]. For every bigha of land 2½ to ... seeds are generally requir[ed] scattering the seeds on the s[eed bed a] light cover of leaf-mould should [cover] it as protection from rain and too [much] light.

The covering mats are to be [taken off] every evening if no rainfall is ap[prehended] at night and the cover put on [at 8] or 9 A. M. otherwise the germin[ation] or even the seedlings will all be ... Some sunlight is needed for se[edlings] else they will grow up into si[ckly] pl[ants]. During this short interval wat[er must be] gently sprinkled on the seedling[s as occa]sion required, say, once in tw[o or three] days if the soil looks dry. When [the] pl[ants] grow a few inches high, they [are trans]planted in the open ground in a ... good soil well soaked with [water and] moderately manured. In pl[aces where] frosts seldom or never occur, [the] pl[ants] may be planted in an open exp[osed situa]tion, in rows 3 feet apart a[nd ...] between the plants, but in Nor[thern India] where frosts are of annual occur[rence they] should be planted in a shelter[ed ...] and closer together. A good [method of] planting for cold places, is t[o set the] plants out in sets of 3 rows, [allowing ...] feet between each row, 15 inch[es] betw[een] each plant, and a space of 3 [or 4 ...]

ween each set of rows as a pathway, when frost is prevalent, or when the ns are exceptionally cold, cover over ry evening with mats or grass tatties il the weather becomes mild.

In cultivating tomato dung and urine ... horses and sheep can be used as ... American scientists have already ... that tomato requires for its ... some potash manures ; for this ... each bigha of land about half a ... f superphosphate of lime and 25 ... of nitrate of potash should be ... the soil just before the land may ... for cultivation. Ashes of ... water hyacinth and even decom... ...sh can be used as manure.

...to plant is a half creeper. It ... erect by itself so it is better ... a piece of bamboo stick vertically ... the ground ; without a support of ... the plant cannot grow vigorously ... sunlight is absolutely needed for ... but instead the branches shoots ... and there and partially lie on the ... producing fruits of small size. ... tying each plant with a bamboo ... is hung a couple of feet above ... between two posts along each ... the plants are loosely tied to the ... means of jute ropes or by means ... fibres.

In order to have a successful cultiva... ...ps of the branches of tomato ... to be cut off. If this is not ... done the branches instead of ... upwards, grow towards the ground ... bush whereby the fruits of ...ality will be produced and at the ... will be very difficult to gather ... All further attention is con... ...ding when needed, and water... ...e in 10 days when the weather ... superfluous growths must be cut ... to allow a free circulation of ... to prevent damping during wet ...

**YIELD**

T...toes grown from imported seeds ... variety, yield 40 to 50 maunds ... But if sufficient manure is ... the soil the yield would increase ... 70 maunds. Selling price of ... this country generally varies ... to 6 annas per seer. Taking on an average the price of tomato as 2 annas per seer the value realised by selling 40 maunds is Rs. 200/-. Deducting Rs. 50/- towards the cost of supervision, water and manure etc., the net profit would be Rs. 150/- per bigha.

If two sowings are made, one in July and one in September or October, fruit may be had in season from October to July, provided of course the protection has been attended to during the colder months in cold countries.

At hill stations, sowings may be made during the spring months, and the plants when large enough to handle, planted out in well drained ground at the distances apart given for warm districts in the plains. The spot chosen for growth should be sheltered from winds but not shaded from the sun.

## CHILLIES

Cultivation of chillies is carried on largely in the Southern Maratha Country, Khandesh and parts of Gujarat ; but the crop is grown in the kharif season. In the Konkan, specially in the coastal parts of the Thana District, this crop is grown also in the rabi season under irrigation, and its produce is sold as green capsules. The reason why this crop does not thrive in the fair season in the Deccan or Gujarat, is that, there is then, excessive cold or heat which the crop cannot stand. The Konkan tract where both cold and heat are moderate is, therefore, specially suited for the cultivation of this crop in the fair season ; besides when there is a great demand for green capsules, in Bombay and Surat, they are required to be imported from the Madras Presidency. The prevailing rates of green chillies are also high and hence there is a scope for the extension of chillies cultivation in the Konkan in the rabi season.

The following extract from Leaflet issued by the Department of Agriculture, Bombay would be of much help to the cultivators of the article.

**VARIETY**

The common variety grown is locally called "Shivvati" or 'Thakari." The, capsules of this variety are short, varying from ¾" to 1½" in length, and have a conical.

shape. In taste they are delicious and pungent.

### SOIL

This crop is either grown on mal varkas lands or rice fields in the rabi season, the soil of which varies from loam to stiff clay. It is irrigated with well water and the area under this crop is over 600 acres in the Thana District.

### TILLAGE

After the close of the monsoon the field or the plot where this crop is to be grown, should be watered and when the land becomes accessible it should be ploughed, preferably with a medium size ron plough. After removing the stubbles, :he colds should be crushed and the plot should be ploughed again. The local practice is then to lay out the area into small beds with manual labour ; but as planting in these beds does not allow the ise of interculturing implements, considerable labour is required for weeding, earthng up, etc., and watering is also required o be given at short intervals. So, instead of these beds, the area should be laid out nto ridges and furrows, 3 feet apart with n iron-ridger or a cultivator or, in the bsence of any of these, with the Gujarat oe with a wooden plank attached between he blade and the head piece.

### RAISING SEEDLINGS

The area selected for these should be igh lying preferably used in the last fair eason for growing rice seedlings. After e removal of the rice seedling, the land hould be kept fallow in the rainy season ll September. In this month it should be loughed, weeded and prepared, for putting seed of chillies. It should then be laid it into beds each 8′ by 4′ Sixteen such eds produce seedlings sufficient for planting one acre of chillies. Half pound of eed is required for sowing these beds. here being a residual effect upon the soil y burning, no manuring is necessary except a light application of powdered cake fish. If the area is not burnt previously, l cake at 1½ pounds per bed should be oplied. Immediately after sowing seed, it iould be lightly covered with finer earth id watered and the beds covered over ith the leaves of palms, coconuts, straw, ass, etc. Next watering should be done on the third day, and should be continued an interval of 3 to 5 days, depending up the nature of the soil. The covering grass or leaves, etc., should be remov after the seed has germinated.

### TRANSPLANTING

In about 5 weeks the seedlings ready for transplanting, being 5′ to 6″ height. It is always desirable to water beds on the day previous to planting. T planting should be 3 feet apart in ... directions and the distance should ... form. The following method sh... adopted.

Along the side of each para... a line should be marked with ... on these lines marked at 3 fe... apa... should be made by passing a rop... 2 men standing on the boundary ... moving along for this purpose. ... points small holes should be made with pointed stick and a handful of ... farm yard manure should be added t... each them. The suitable time for planting either evening or morning. The loca practice is to take 4 to 5 seedl... an plant them together ; but by experience, is proved that it is not necessary to have many planted together. Only two seedings in one bunch are recommended. The whole area should be watered immediately after planting, and this watering should be repeated on the third day. Subsequen watering should be done at an interval of 8-12 days in winter and 4 to 8 days in summer, depending upon the character of the soil.

### ROTATION OR MIXTURE OF CROPS

There is no special practice ... in the Konkan as in the up-ghat ... the rainy season rice is grown ... fair season such crops like chillies, ... onions, etc., are grown, selection dep... upon the fancy of the cultivat... would be advisable to have some ... in alternate years instead of chill... year after year. This would min... damage caused by pest and diseases as well as introduce the benefits of rotation.

### AFTER-TREATMENT OF THE CROP

The crop should be interculti... four to five times. This also removes the weeds economically.

## MANURING

In manuring castor cake should be used alone, or a mixture of castor cake, sulphate of ammonia and bone-superphosphate as given below :—

| Name of Manure. | Quantity per acre. | Time of Application |
|---|---|---|
| Castor cake (alone) | | |
| Castor cake | 900 lbs. | 1st About three weeks after planting. |
| Castor cake | 1,800 „ | 2nd Two months after first application. |
| Mixture of castor cake and sulphate of ammonia and bone-superphosphate. | | |
| Castor cake | 450 „ | 1st About three weeks after plating. |
| Sulphate of ammonia | 90 „ | |
| Bone-superphosphate | 90 „ | |
| Castor cake | 900 „ | 2nd Two months after first application. |
| Sulphate of ammonia | 180 „ | |
| Bone-superphosphate | 180 „ | |

Both castor cake alone and the mixture consisting of castor cake, sulphate of ammonia and bone-superphosphate as stated above are found to be equally [illegible] and the selection should be made with reference to prices. Besides, when [illegible] manure is available, it should [illegible] at the rate of 20 cart loads per [illegible] preparing the land. When this [illegible] there is no necessity for the first [illegible] of the cake manure.

After each manuring the crop should [illegible] up with an iron cultivator of a [illegible] with the interspace closed with [illegible]

## HARVESTING

[illegible] picking is obtained three months [illegible] and the subsequent one at an [illegible] 3 to 4 weeks. The interval [illegible] successive pickings should not [illegible] to exceed this period.

## DISEASES AND PESTS

The common pest noticed is the mal[illegible] of the plant and the curling of [illegible] is locally called "Murda." [illegible] specially noticed in winter and is [illegible] to be more virulent if there be [illegible] watering. Withholding of water [illegible] days and exposing the soil by [illegible]-ploughing for aerating has some beneficial effect. Besides this pest, there is a fungoid disease of the wilttype which kills the plant. This disease is carried in the soil ; hence in order to control this disease it is advisable to adopt a suitable rotation.

## OUTTURN

The crop is invariably sold as green capsules and the outturn per acre is estimated at 11,200 lbs. valued at Rs. 700/-, at 16 lbs. per rupee.

# GINGER

Although ginger is cultivated in all the tropical parts of the world still it is doubtless a native of Southern Asia, where it has been cultivated and exported from the very beginning of civilisation. In India it is grown throughout the warmer parts but chiefly in the plains.

This plant belongs to a family of aromatic herbs with creeping root stock or rhizomes. Turmeric and cardamom also belong to the same family. The ginger plant is a perennial and can grow well in the shade ; hence the adjoining land under large trees such as mangoes, etc. could be utilised with great advantage thus keeping out the insect-pests which would otherwise do much harm to the fruit plants.

### SOIL AND ITS PREPARATION

Stiff clayey soil are not suitable for any root crops, but any soil which is not stony, gravity or gravelly will do for growing these crops. It also likes a deep, rich, free working soil, which is naturally well drained. It grows to great perfection on the deep, alluvial, sandy places like the loam of Baroda and Kaira.

When the plot selected for cultivation of ginger for the first time, it is desirable to plough up the land just after the rainy season is over because at that time the land is in a fit state for ploughing. After ploughing the laddering is done so as to break up the lumps, thus making out most preparation during the cold weather for these crops. In the following April after the first shower of rain another ploughing and laddering will render the land fit for planting the bulbs of ginger.

### MANURING

Manuring is scarcely done for this plantation but a maund of ashes and 2 or maunds of oil-cake per acre would benefit the crop and the trees under which it is grown. If manuring is neglected, the trees under whose shade these are grown would suffer injury due to repeated cultivation. The manuring should be done twice, just after the bulbs are planted and before the roots are earthed.

### PLANTING

After preparing the soil, the ginger sets which consists of pieces of the rhizome bearing two or three buds are planted with the greatest regularity in rows at a depth of about 2 inches below the surface and span of 9 inches apart in each direction. With a narrow implement a number of equidistant little pits are carefully produced. The sets are pressed down into these pits, covered with soil and the whole surface smoothed with the land

About two maunds of the ginger seed are required for planting an acre. When the plants have come up and before the advent of rainy season earthing should be done along the natural inclination of the ground to make passages for the heavy downpour from the neighbourhood of the plant.

### WEEDING

Weeding is thoroughly done by hand the crop may have to be gone over from three to six times according to the condition of the field. The weeds should lifted up dexterously in each operation descend below the surface and [illegible] with an extensive system of rhizomes when it is impossible to eradicate and th damage the crop to a great extent.

### IRRIGATION

The plant must be watered every six day until the rains. If thereafter there a break in the rainfall of more than [illegible] days' duration, irrigation must be [illegible] When the rains cease, irrigation is [illegible] every sixth day until the crop is ripe. The crop is ready for harvesting by the end of November or beginning of December, but no certain rule can be given.

### HARVESTING

When the leaves have completely withered, the root is dug out by hand with a small hand pick and is sold to dealers who either sells it as ginger or converts it into sunth or dried ginger in which form it is used for condiments and medicines.

### STORING

The central room of any ordinary well built-house is usually cool and therefore the most suitable apartment for the storage of ginger. A cool moist atmosphere and ventilation are required. The [illegible] should be sorted before it is stored and any decayed portions removed. The [illegible] ment is prepared by digging up the [illegible] floor 10″ to 12″ deep and by soaking the upturned earth with water. The water [illegible] absorbed in eight or ten days and the floor becomes dry enough. The [illegible] sorted ginger is then kept up in a [illegible] height of 4 to 5 feet. The heap when finished is covered with dry ginger leaves which are often sprinkled with water. The heaps are examined once in a week and it found that the middle portion is warmer than the rest the whole is removed from the room and any rotten pieces separated. In three or four days the ginger is again heaped up. If the heap remains cool during the storage, it would be concluded that the substance, is all right.

### PREPARING DRIED GINGER

There are two known methods of ing ginger: (1) ordinary curing, (2) ...-lime curing. The former is ...ed in all ginger-growing countries, the ...nd is practised only in certain districts India.

### ORDINARY CURING

...dinary curing is carried out with ...eloped, properly matured rhizomes. ...ginger is sun-dried and the adhering ...th is removed as much as possible. The ...eration in preparing dried ginger ...oak the partially cleaned rhizomes ...ater. This with rubbing cleans the ... and also softens them. The ... facilitates the removal of the outer ..., ... is scraped off with a shell or ... pieces of earthenware. The ... ginger is now washed and exposed ... or four days to the sun. The ... is thus bleached and dried. It is ...bed by hand. The operation is ...carefully, so that the shoots are not ... The ginger is again bleached in ... followed by rubbing as indicated ... After this the ginger is steeped ...ater for about two or three hours and ... the sun to dry. When dry it is ... a coarse cloth, which removes ...aining outer skin not removed by ... operations.

### MODIFICATIONS

...erous modifications of this pro... ...een adopted at various places. ... parts of India the ginger is ... water for as long as two days. ... the roots are placed in water ... they are uprooted for, should ... be dried with the soil and roots ... it, the product will not be ...

... in Gujarat is carried out either ... with a piece of earthenware ... rubbing the rhizomes on a coir ...stead. In Jamaica ginger peel... ...sidered an art. The expert peels ... fingers of the hand and the ...rienced peels the other portions. ... bladed knives are used in peeling. ... parts of S. India no peeling is ... after being well soaked the ginger ... under foot in the washing tanks. This considerably lowers the cost of production.

The peeled product should be immediately put into a tank of clean water and thoroughly washed with frequent changes of water. This has been found very necessary if a light-coloured dry product is to be obtained. On exposure to air the peeled rhizomes darken considerably in colour and this stain persists. Where ginger is being cured, a good source of water supply should therefore be near at hand.

In order to obtain a white product peeled ginger, after washing, is soaked for some hours in lime water and then allowed to dry. The lime may then be washed off, if required. Liming improves the keeping quality of the ginger.

Drying is carried out in Jamaica on cement barbecues, and in certain places in India, on mats and gunny bags on the ground. The latter practice should be avoided if the ground is wet or damp. In certain districts in India after the ginger is well dried, it is carefully rubbed by hand on a coarse gunny bag and then allowed to dry again. This is said to improve the white colour of the dry product.

### SULPHUR CURING

In sulphur curing, the green ginger was treated as in the ordinary method but after peeling it was placed in a tank of lime of the consistency of whitewash for a period of about two hours, during which time it was stirred once or twice. The ginger was then put into wicker or coir-bottomed baskets and placed on bamboo racks or shelves in a closed chamber and sulphured for 4 hours. A mud-wall room 6 ft. by 6 ft. was used for this work. It had a door at one end and a hearth opening from the outside at the other. The hearth consists of an iron pan or tray supported on a semi-circular wall about 1 ft. 6 ins. high. Sulphur was placed on the tray which was then heated from below. The quantity of sulphur used in the first instance was 7 lb. per 1500 lb. of green ginger. The next day the ginger was placed in the sun to dry and in the evening the liming and sulphuring process repeated. 8 lbs. of sulphur were used this time and the period of sulphuring was increased.

to 12 hrs. The process was repeated a third time, the quantity of sulphur having been increased to 9 lb. and the period of exposure shortened to six hours. The product was then left to dry on the barbecue and when well dried, the lime was washed off and the rhizomes put to dry again thoroughly.

The dry ginger so obtained is a comparatively plump, almost white-coloured and with a good fracture. It is much less susceptible to mould and insect attack than ordinary dried ginger. The disadvantage of the method, apart from the small extra cost and the trouble necessary, is that the product so cured is not saleable in all countries owing to the sulphur dioxide it contains.

It is recommended that only sound, fully-developed rhizomes should be used for drying. While the first year rhizomes are best for drying, second year rhizomes can also be used advantageously.

The great advantage of curing is that when there is no market for raw ginger owing to an over-supply, it would be a means of preserving the crop for at least a period of a year.

## RADISH

This is an annual, a native of China, and is cultivated for its fleshy roots, which are generally eaten raw when in a young condition. There are two principal varieties, the long-rooted, and the globular or turnip-rooted, and numerous sub-varieties of both.

An acclimatised, long white-rooted variety is extensively grown in Northern India by the market gardeners, but it is not held in favour by the European, owing to its mildness and general want of flavour. It is usually sown in the rains, sometimes very early, as it is often met with in the bazars by the middle of July. A second kind also exists with roots similar to the one above described, but it is not grown for the root, although the latter can also be used, but for its long seed pods, which, when young and tender, are eaten both raw and cooked in vegetable curries. It is known to the European under the name of rattailed radish (Raphanus caudatus) and by the local inhabitant as seengra, probably so named from the word seeng or horn, owing to the horn-like appearance of the pods.

All the imported varieties readily acclimatise in Northern India, and show no degeneration even when grown over a long series of years from the same strain, provided seed is always gathered from sound wellshaped roots, and then no plants of the common longrooted white kinds are allowed to flower near them. When it is desired to save seed, the most shapely and best developed roots of October sowing should be taken up when about the size of a tennis ball in the case of the globular kinds, and when rather thicker than the thumb in the case of the long-rooted sorts and transplanted in rich soil at 3 feet apart each way. Before planting them out, however, the leafy tops should be cut off, as also a portion of the fleshly root from the lower or root end. When ready for planting, the roots should only possess the growing crown, and about two-thirds of the fleshy part below, and, when being planted should be inserted sufficiently deep in the ground to allow of about 2 inches of soil to cover the crowns. Shortly after planting, new leaves will spring out, and numerous root fibres will be produced from all sides of the original fleshy root to secure nourishment for the tall branched flowering shoot that will eventually [illegible]

The radish requires a [illegible] manured soil and plenty of water from the time of sowing until large enough to use. As the roots only remain in a fit condition for the table for a short time, sowings should be made at intervals of ten days or a fortnight when a constant supply is desired. The seeds, whether imported or acclimatised, may be sown at [illegible] between the middle of August and [illegible] January, but when it is desired [illegible] the common long-rooted country [illegible] beginning may be made as soon as [illegible] have fairly commenced. Sowings [illegible] made thinly broadcast in beds, or [illegible] lines at 6 inches apart, and in [illegible] thinning out to 3 or 4 inches asunder. Owing to the short time the roots remain in the crisp tender condition they should be in when seen upon the table, little after-cultivation is needed. A single weeding will usually suffice for each sowing.

At hill stations, sowing may be made March until the end of August, but the rains are in progress, some protection should be given during the occurrence of heavy showers.

## ONIONS

There are very few vegetables cultivated in the dry parts of India with more success than this wholesome onion. It has had the fortune to be generally appreciated in almost every househould. It improves the flavour and digestibility of important articles of food that would nourish us without its aid, while to all it adds a zest that contributes ailke to enjoyment and health. Although there are few difficulties to be encountered in the cultivation of this esculent, there is a great difference between a well-grown and one under poor management.

The variety most generally grown ... the common pale-red onion of ... It is mostly depressed globular ... but evidently little care has been taken to secure uniformity. In colour it is red outside and creamy-white, with ... streaks inside. The skin is membranous and fragile and the flesh very firm. ... is mild, and the bulbs keep ... White skinned onions, which differ from the pale-red sort, are grope in ... parts of India especially in the ... of Dhulia and Banaras.

### TREATMENT OF SOIL

The onion can be grown on any kind ..., but poor land must be assisted by ... manuring. For handsome bulbs ... crop a deep rich loam of a ... light texture is required, al... adhesive loam, or even a clay ... proved for the purpose ; while ... soil excellent results may be ... by good management. In any ... soil must be well preparerd by ... breaking the lumps, and laying ... ridges to be disintegrated by the ... and if needful its texture should ..., as far as possible, at the ... A coat of clay may be spread ... of sand, to be thoroughly incorporated with it ; on the other hand, ... the staple is clay, the addition of ... be advantageous. All such ... measures yield an adequate ... if prudently carried out, because it is possible to grow onions from year to year on the same ground. The plant is not fastidious, and it is easy work almost anywhere to grow useful onions. The first step in preparing the soil is to make it loose and fine throughout, and as far as possible to do this some time before the seed is sown.

### MANURING

As almost any soil will suit the onion, so also will suit almost any kind of manure, provided that it be not rank or offensive. This strongly flavoured plant likes good but sweet living, and it is sheer folly to load the ground for it with coarse and stimulating manures. Yet it is often done, and the result is a stiffnecked generation of bulbs that refuse to ripen, or there may be complete failure of the crop through disease or plethora. But any fertiliser that is at hand, even the sweepings of poultry yards or pigeon lofts, may be turned to account by the simple process of first making it into a compost with fresh soil, and then digging it in some time in advance of the season for sowing, and in reasonable but not excessive quantity. All such aids to plant growth as guano, charcoal, and well rotted farmyard manure, may be used advantageously for the onion crop ; but there are two materials of especial value namely, that are universally employed by large growers, both to help the growth and prevent maggot and chanker. These are the lime and soot. These are sown together when the ground is finally prepared for the seed, and in quantity only sufficient to colour the ground. They exercise a magical influence, and those who make money by growing onions take care to employ them as a necessary part of their business routine.

### SOWING THE SEED

Having been well dug and manured in good time, the top spit only should be dug over when it is finally made ready for the seed. The work must be done with care, and the beds should be marked off in breadths of four feet, with one-foot alleys between. Break all lumps with the spade, and work the surface to a regular and finely crumbled texture. Light soil should be trodden over to consolidate it, and then the surface may be carefully touched with the rake to prepare it for the seed.

tember and October are not usual
ıths for sowing the seeds, but in several
:s seeds are sometimes put even in
'ember. The seed bed are germinated
few days and begin to grow vigorously
when the plants are up a few inches,
4 inches apart in rows. The ground
t be laid out for irrigation, and water
'n once a week in dry weather.

Space the rows from nine to twelve
ıes apart, according to the character
he sort and the size of bulbs required.
drills must be drawn across the bed, at
t angles to the alleys, for when drawn
other way it is difficult to keep the
ınd properly weeded. For a crop of
ıns intended for storing, the seed should
ınly just covered with fine earth taken
n the alleys and thrown over, after
:h the drills must be lightly trodden,
surface again touched over with the
, and if the soil is dry and work
ly, the business may be finished by
:ly patting the bed all over with the
c of the spade. If the ground is damp
ıeavy, this final touch may be omitted,
the onion makes a peak grass that
ıot easily push through earth that is
ed over it. But speaking generally, an
n bed newly sown should be quite
oth as if finished with a roller. To
beginner this will appear a protracted
complicated story, but the expert will
st that onions require and will abun-
tly pay for special management.

As soon as possible after the crop is
ble the ground between should be deli-
ıly chopped over with the hoe to check
weeds that will then be rising. Imme-
ely the rows are defined a first thinn-
should be made with a small hoe, care
ıg taken to leave a good plant on the
und. Keep the hoe at work, for if
ds are allowed to make way, the crop
be seriously injured. When onions
doing well they lift themselves up and
on the earth, needing light and air
n their bulbs to the very axis whence
roots diverge. If weeds spread
ıngst them the bulbs are robbed of air
light, and their keeping properties are
ıaired. But in the use of the hoe it
mportant not to loosen the ground or to
w any earth towards the bulbs. Really
onions are rarely produced in loose
ınd, hence the necessity for care in the
use of the hoe. Watering is not often
needed.

If an attack of mildew is occurred, a
dusting of flowers of sulphur will pr...
effective if applied immediately the dis...
appears. Sulphide of potassium, one ou...
to a gallon of water, is also a reliable
remedy.

### HARVESTING

The harvesting of the crop require...
much care as the growing of it. If
goes well, the bulbs will ripen natur...
and being drawn and dried on the gr...
for a few days may be gathered up ...
topped and tailed or bunched as may
most convenient. But there may be a b...
hesitation of the plant in finishing grow...
the result, perhaps, of cool moist weat...
when dry hot weather would be better. ...
this case the growth may be checked by
passing a rod (as the handle of a rake ...
example) over the bed to bend down
tops. After this the tops will turn yel...
and the necks will shrink, and advant...
must be taken of fine weather to draw ...
onions and lay them out to dry.

As to keeping onions, dry, cool, a...
airy place will answer. But if a difficu...
arises there is an easy way out of it, ...
onions may be hung in bunches on an op...
wall under the shelter of the eaves of a...
building, and thus the outsides of bar...
and stables and cottages may be converted
into onion stores, leaving the inside f...
for things that are less able to take c...
of themselves. During severe frost t...
must be taken down and piled up anywhere
in a safe place, but may be put on th...
hooks again when the weather softens, ...
a slight frost will not harm them in ...
least, and the wall will keep them compa...
tively firm and dry. When the best p...
of the crop has been bunched or roped, ...
remainder may be thrown into a heap in ...
cool dry shed, and a few mats put o...
them will prevent sprounting for at lea...
three months. But damp will start th...
into growth, and the only way to sa...
them is to top and tail them again, and
store as dry as possible in shallow bask...
or boxes.

## PLANTAIN

The plantain, or "Musa paradissical"
as the scientists call it, is perhaps nowhere

he world so much associated with reli-
ı as in India. No auspicious ceremony
'estival of the Hindus can be commenc-
without the customary high religious
em unless its utility is undoubted and
ıt it may be easily assumed that the
ıtain has always proved to be of
ıense value to Indians. The presence
wild and cultivated plantain in India
ıts to the fact that plantain is both a
ve of India and that its cultivation in
country dates from prehistoric times.
ral varieties of plantains are to be
ıd in India and abroad but it is pretty
ain that all of them proceed from one
l stock. There are, at present about
nty varieties of plantains which under
rent local names are well known both
Northern and Southern India. The term
nana" is generally substituted for
ıtain outside India, but to avoid con-
on, it should be applied to those
eties of plantains only which are eaten
and uncooked.

As a result of modern investigation
food materials, eminent experts have
e to the conclusion that it would be
l to find another food product which
sesses, weight for weight, the same
itive value as plantain. There are still
ıtries in the world, e.g., the great lake
ons of Africa and certain portions of
tral America where people mainly
nd on ripe and unripe plantains for
r ordinary food. Even during the late
millions of men of Central Europe
ıd in fried banana products an import-
auxiliary in making up their diminish-
food supply.

As a food product plantain is used in
ral ways. The small ripe, sweet
ydrated fruits find a large sale under
name of banana figs. Large sized
ts, richer in starch than sugar, are
le into meal or flour much used in
ed products and confectionery. A jelly
lso prepared from the ripe fruits. In
a the mature but unripe fruits of a
iety of plantain (Kanchkela), the pith
the abortive flower at the end of the
rescence (Mocha) are all used as in-
lients of several much relished dishes.
lower portion of the stem of the
ıtain contains a large amount of starch
provides food to the poor in times of
ine and scarcity.

Although plantain is to be found every-
where in India except in the driest and
coldest regions, it is difficult to form an
estimate of the area under it, it being
included in the Agricultural Statistics in
the general heading of "Orchard crops."
In the Presidencies of Bengal, Bombay and
Madras and in Orissa the average of
plantain must be large judging from the
number of gardens met with on every side.
It cannot however, be said that the merits
of the plantain have been sufficiently
appreciated in India. In comparison with
the West Indies where banana forms one
of the most important sources of wealth
very little attention has been paid to the
production of plantains in India. Wet
plantain is not a difficult crop to grow. A
large number of varieties of soil will suit
plantain, provided there is enough moisture
and no chance of water logging. Some of
the best plantations are even near the sea
coast but plantain grows equally well
hundreds of miles inland. Protection from
high winds is however, always necessary.
While it is very much desirable that there
should be ample extension of the area
under plantains extension of area only will
not serve the higher economic purposes
unless determined efforts are made to
utilise plantains on modern lines. Following
is a list of some of the popular varieties :—
Martaman, champa, chini-champak, kan-
thali, anupan, ram-rambha, kanai-bashi,
agnishwar, Bombay, Kabuli, Singapuri.

**SOIL**

The banana will grow on moist soils.
It delights in the climate of the coast, but
will grow whenever it can get plenty of
water and where it is protected from hot
drying winds i.e. to say clayloam soil not
subject to water-logging and situated
close to tank, jhil, or canal can be chosen
for the cultivation of plantain. The land
is next ploughed and cross-ploughed several
times.

**CULTIVATION**

The banana plant has no seed, but is
propagated by young plants which bud
from the under ground tuberous stem, or
"bulb," as it is called, of an old plant.
This bulb at first gets all its food material
from the parent bulb but very soon forms
leaves and roots of its own. Its first

leaves—second leaves—are very long and narrow as compared with those developed later. When the young plant is 6 or 8 months old, it is about 9 or 10 feet high, and its own bulb is 8 or 10 in. across. This is cut clean away from the parent, and the roots trimmed off. It may be planted as it is but for convenience of carrying and to prevent its being blown over before its roots anchor it, it is cut down to within 6 in. of its bulb. This bulb soon shorts, both from the centre and from eyes all round. If a bulb is cut vertically, the eyes or young buds can be traced, clearly showing that the bulb is a stem structure.

The suckers of desired variety are not collected and these are planted in a row 12 feet apart each way in the beginning of the rainy season. The pit should be made a cubit deep and manured.

#### MANURING

The banana is a gross feeder and needs liberal manuring, best given in three doses, one month, two months, after planting, castor cake 10 lbs. plus fish 15 lbs. per tree is an excellent manure. Castor cake 4 lbs. sulphate of ammonia 1 lb. sulphate of potash 4/5 lb. and calcium superphosphate 7/8 lb. has proved useful. Green manuring is desirable once a year and the soil must be kept well hard.

The first crop comes in 10-12 months from planting, and is poorer than any succeeding crops. Succeeding crops in well treated plantations should come on every 5 months and be twice the weight of the first crop. When a banana tree has fruited it dies and must be cut out ; its makers replace it. There is an art in regulating these suckers. One should be half grown when the old tree is fruiting, and another should be about 2 feet high – others being cut out. A successive of fruiting trees is thus obtained and overcrowding prevented. The number of fruits per tree is greatly increased with good manuring and cultivation, and is decreased by neglect. After 5 years a banana plantation should be cut out and the land given to other crops for 3 years before are put on it again. The fruit bunches severed when the fruit is full-grown and is hung up in a dark cool place to ripen. In the ripening process the starch of the fruit changes to sugar, and proportion of pulp to skin increases. A disease (black rot) due to the fun Gloesporium musarum occasionally att the fruits both on the tree and in st It can be prevented by spraying w ammoniacal copper carbonate.

## PINE-APPLE

The pine-apple is regarded as on the most delicious fruits met with tropical regions. It is known to bota as Ananas Sativa, a familiar plant h native of South America from wher appears to have been dispersed all the world and acclimatised in tropical and sub-tropical countries. Spaniards called it Pinas from its semblance to the pine-cone but the P guese named it Ananas being adapte their own tongue its Brazilian name Na

The pine-apple was first introduce the West coast of India by the Po guese, but it rapidly migrated the coun and attained its greatest perfection the Eastern Peninsula. From Calc through Eastern and Northern Bengal Assam and Burma may be said to be Indian habitat yielding a profusion of m delicious fruit, though it also occurs and there throughout India, and is abundant on the West Coast. It is not by any means exclusively in the litt tracts, nor within the inundated areas India, that the pine-apple has attained greatest perfection, but rather consi ably inland and on the dry, sandy lo of the lower hills and tarai, though tracts of country subject to a high an rainfall. "A" warm, moist atmosp and a well-drained sandy loam w appear, therefore, to be the essentials success with pine-apple." (Watt).

#### DIFFERENT VARIETIES OF PINE-APPL

There are various types of pine-ap cultivated in India of which the follow are generally recognised :—

1. The Bengal variety is not by means an indifferent fruit w grown in a situation exposed to sun. The large intensified fru sold in quantities are nearly produced under the shade of tr the shade conducting as mu perhaps to the size as it tends detract from the flavour.

2. The Ceylon is decided to be the finest in flavour of all. The fruit is rather large, greenish when young and of an orange colour when ripe.
3. The Sylhet or Koomlah variety yields a small fruit with very few but exceptionally large eyes.
4. The Dacca variety produces a remarkably smooth pine with white eyes.
5. The Penang : one or two sorts introduced from Penang differ but little from the ordinary Bengal kind.
6. Conical-crown : a curious variety also introduced from Penang.
7. Streatifolia : a variety introduced from Java.

### SOIL : ITS PREPARATION & MANURING

The best suitable soil required for the ultivation of pine-apple is a sandy loam ith good drainage and next to it come he free sands and gravels. Clay of all inds and badly drained lands are unsuited. good proportion of lime is advantageous nd also the animal manures perfectly otted should be put near the plants as it roduces a beneficial effect to their growth. ut rich soils and strong manures are uite unsuitable for its cultivation as ointed out by Firminger that the plants ay rot and perish from an over supply f manure. Further that soil thoroughly ghtened with leaf-mould, well decayed owdung and sand is said to be the best which pine-apples will thrive to rfection.

### SEASON FOR PLANTING

The proper season for planting out ne-apples is in the month of August. A il should be chosen for them where they ay be fully exposed to the sun. They ould be placed in rows at a distance of 3 et apart between each row and at a stance of two feet from each other in e row. " A better plan would be to lime t the land in rows of 6 feet apart, and plant the suckers at a distance of 3 feet the rows and after the first crop a few the suckers could be left and then this ould yield more than double fruits for the cond crop." (Nicholls). It is most important to have fairly large spaces between the rows since the plants being spiny the necessary room for working the land has to be provided. Moreover, after uprooting and preparing the land for relining it is possible to set the new plants on the inter-spaces not occupied by the former crop, and thus to continue cultivation on the same land very nearly indefinitely.

### PROPAGATION

When the fruit has formed, numerous suckers will be found around the parent stem. These are perfectly selected for propagation, though, of course plants may be raised from the crown of leaves taken from the fruit, and even from the black seeds often found within the fruit itself.

The selected suckers or the green crowns from the fruit are planted in the sand during the rainy season and when they have grown a few inches, they are transplanted on the prepared soil in rows. The oftener the plants are transplanted, the more will their growth and quality be improved.

### WATERING

After the rains, no water should be given to the plants till they have set their fruit in February and March, when, as well as during all the time that the fruit is swelling, it should be bestowed abundantly. It is important also that at the same time the leaves should be well cleansed by occasional drenchings from above, in order to remove the dirt and dust that would otherwise clog their pores, and so impede the passing of the water they imbibe at their roots.

### TIME OF FRUITS

The pine-apple flowers in February and March, and ripens its fruit in July and August. After which, in September and October it makes its principal growth. It sometimes happens that plants instead of making growth break into flower, and so produce fruit in the cold season. This is by no means desirable, as the fruit produced, unseasonably does not ripen for want of sufficient heat, which is necessary for this purpose ; hence it is almost invariably acid and uneatable. Young-

roots and suckers not required should be removed from the plants as soon as they make their appearance.

The pine-apple is much improved by having the leafy crown of the fruit twisted out when about 4 inches in height, and a piece of the tile laid upon the top. In Bengal the usual method carried out is that the crowns are cut off when nearly full grown but this reduces the flavour to a great extent.

### HARVESTING AND METHOD OF TRANSPORT

When the fruits are about to ripen fully, they are cut off with a sharp knife through the middle of the stalk. In despatching to a distant place each fruit should be wrapped in straw or paper, and deposited if possible in a separate compartment for two or three fruits. When either bruised or over-ripe, fermentation takes place and the entire consignment may be ruined through the presence of one fermenting fruit.

### PROSPECT

In recent years much attention has been paid to the study of the varieties and races of pine-apple, as also to the methods of cultivation and markets of supply and demand. In India, while the plant is extremely abundant as a fruit grown in gardens and in some localities even no effort has been put forth either to improve the quality or to develop on a commercial scale, the industry of pine-apple growing, which it would appear might be cultivated with advantage to India and profit to those concerned.

## PAPAYA

The Papaw or Papaya known to Botanist as Carica Papaya is a familiar plant growing abundantly in the plains of India and Ceylon. It is said to be a native of South America from where it is distributed in course of time to the other parts of the globe. Although it fruits satisfactorily in the plains, yet it does not grow well in the hills in colder regions except in South India, where it thrives best as in the plains even at a height of 4,000 feet above sea-level. In foreign countries it is taken as a profitable commodity. For this reason it is cultivated with much care in large tracts of Phillipine Isles, Brazil, Florida and California. But in India condition is quite different. Here fruit c ture is entirely neglected and the pe are hankering after services.

But in spite of this fact it is prop to discuss in this article the cultivatior papaya from the economic point of v so that a number of our unemployed y may pay their attention to fruit culti tion.

### VARIETIES

There are numerous varieties papaya in cultivation. There are s mammoth varieties the fruits of wh weigh about 5 to 6 pounds each. Am the best varieties are the Ranchi, Cey Singapore and Moulmein fruits. ordinary Bangalore and Madras fruits also sold in the market. In Banga many gardeners sell very good pl which bear railway journey very well, can be successfully transplanted.

### PROPAGATION, ETC.

The papaya grows in all soils climates in India. But it does very wel red sandy loams. Stiff clay and b drained swamps or marshy lands are good. The papaya can be easily raised sowing seeds. Choose a good fully fruit which is full of flesh, and in which hollow seed cup is very small contair very few seeds. Take out those see wash them with clear water ; and t mix them with some good fine ashes earth and dry the seeds in the sun. A about 15 days, sow these dry seeds i seed bed in a nursery about one foot ap In about two months, we get small pap plants about two feet high. These sh be removed with their roots carefully transplanted in the open fields. The l in which the papaya is to be gr permanently must be well ploughed onc January or February, and a second t one month later. Afterwards dig pits the ploughed land, 2 feet long, 2 feet br and 2 feet deep. These pits should be to 15 feet distant from each other l ways.

### TRANSPLANTING

Plant one seedling in each pit. W planting, throw into the pit 5 to 10 pou of bones. Then fill up the pit by mi

e basketful of well decayed cowdung or rse manure or road sweepings. Then ter the plants. For about a month after nting water plants regularly two or ee times a week if there is no rain. e seedlings would then have established nselves and rooted freely. The best son for transplanting is from July to the d of October. But being hardy plants, ept during the months of May and June, en it is very hot, they may be planted ny time.

It is to be noted here that as a papaya nt possesses only one main root with a side roots, which penetrates deeply into ground, it is very difficult to transplant without any injury to the plant. So articular attention should be given in nsplanting.

**MANURING AND IRRIGATION**

If the gardener wants to have good y sweet fruits in abundance, the papaya s must be irrigated during the hot nths and also when the young fruits are turing, about once a week in light dy soils or loams ; and once in 10 days, clay or other retentive soils.

The best manure for papaya plants is se dung, which is only one or two nths old. Every year the soil round h tree to a distance of about two or e feet should be dug to a depth of about foot, and one basketful of horse dung ghing about 25 lbs. mixed with the soil. s mixture is put into the pits and ssed firmly. Horse dung is a heating nure, and is available as plant food very n after it is applied. Therefore it is essary to water the plants well or gate the garden, soon after the manure applied. The manure is generally lied from November to February ing the cold weather.

**MALE AND FEMALE TREES**

Among the papaya, some trees bear y male flowers : and others bear only nale flowers. The male trees are barren d will never bear fruit. In the male tree also, the female flower must fertilised by the pollen of the male wer. Therefore it is necessary to ve a few male trees also in the apaya garden. One male tree can fertilise 100 female trees. The male tree can be distinguished from the female tree as soon as it begins to flower. The male flowers are borne in clusters in long pendulous bunches or racemes ; and are fragrant. The female flowers on the others hand, though bigger, have only a very short stalk and have little or no smell.

**OUTTURN**

Each tree yields on an average about 100 fruits a year, which weigh about 200 to 300 lbs. Though the trees bear all the year round, the best fruits are got in the cold weather, between the months of October and March. To obtain good choiced fruits, it is best to thin the fruits i.e. to remove about one-third or half the number of fruits growing on the tree ; when they are yet very small and tender.

**PROPERTIES AND USES OF PAPAYA**

Besides affording a valuable vegetable fruit, a most valuable digesting ferment known as papain or vegetable pepsin can be easily manufactured from the milky juice of the fruit. This papain is recognised by medical authorities both here and abroad and is largely used by them. We get about one gramme of milky juice from each fruit. So from one acre yielding about 50,000 fruits we get over 60 lbs. of juice, from which we get about 20 lbs. of dry papain. In Madras the price of 1 ounce of papain made in Germany is Re. 1/-. The papaya tree wards off mosquitoes and thus affords protection against malaria.

The fruits are delicious and contain vitamins. The fruits cure enlargement of the spleen and many other diseases. The ripe fruit is eaten by all classes of people and is esteemed innocent and wholesome. A wonderful range in quality is observable. In some localities such as Hazaribagh in Chota-Nagpur and Gauhati in Assam, the fruit is large and very sweet, in others it small, coarse and hardly edible. The better qualities of the ripe fruit are eaten with a little sugar and fresh lemon juice, and by some people with pepper and salt.

The papaya has also its industrial use. The milky juice of this fruit is used in softening tasar cocoons and thus facilitating their being reeled, has recently received some attention. Moreover as already

mentioned above from the papaya juice vegetable pepsin or papain is obtained.

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# —PHARMACEUTICAL RECIPES

## HAIR TONIC

| | | |
|---|---|---|
| Beta naphthol | 10 | gr. |
| Quinine hydrochloride | 5 | „ |
| Resorcin | 10 | „ |
| Bay rum | 5 | fl. oz. |
| Distilled water to make | 20 | „ „ |

Mix all together in a stoppered bottle.

## STAINLESS IODINE OINTMENT

| | | |
|---|---|---|
| Iodine | 1 | oz. |
| Oleic acid | 4 | „ |
| Soft paraffin | 14 | „ |
| Hard paraffin | 1 | „ |

Dissolve the iodine in the oleic acid and ... intimately with the paraffin.

## SCURF POMADE

| | | |
|---|---|---|
| Salicylic acid | 30 | grains. |
| Borax | 15 | „ |
| Soft paraffin | 1 | oz. |
| Balsam of Peru | 30 | grains. |
| Oil of Cinnamon | 3 | drops. |
| Oil of bergamot | 10 | „ |

Mix.

## KIDNEY PILLS

| | | |
|---|---|---|
| Powdered squill | ½ | gr. |
| Powdered digitalis | ½ | „ |
| Potassium nitrate | 2 | „ |
| Extract of buchu | ½ | „ |
| Oil of juniper | ½ | drop. |

Make into one pill.

These pills are diuretics and stimulants of ... urinary tract constitute the active princi-...s.

## COUGH DROPS

| | | |
|---|---|---|
| Brown sugar | 10 | lbs. |
| Tartaric acid | 2 | oz. |
| Cream of tartar | ½ | „ |
| Water | 3 | pints. |
| Anise-seed flavouring | | q.s. |

Melt the sugar in the water, and when at a ...rp boil add the cream of tartar. Cover the ... for 5 minutes. Remove the liq. and let the ...ar boil up to crack degree i.e., if a quantity ...syrup is allowed to drop on the cool floor it ...once sets to a hard mass. At this stage turn ... the batch on an oiled stone slab, and when ...l enough to handle mould in the acid and ...ouring, pass it through the acid drop rol-... and when the drops are chipped up, and ...ore sifting, rub some icing sugar with them.

## PAIN BALM

| | | |
|---|---|---|
| Yellow vaseline | 10 | parts. |
| Methyl salicylate | 2 | „ |
| Oil of Cajuput | 2 | „ |
| Oil of Eucalyptus | 2 | „ |
| Menthol | 2 | „ |
| Camphor | 2 | „ |
| Wool fat | 20 | „ |

Mix thoroughly in a stone mortar and put in wide-mouthed bottles. It may be rubbed gently over the affected parts.

## NEEM, CHAULMOOGRA SOAP BY COLD PROCESS

| | | |
|---|---|---|
| Coconut oil | 20 | srs. |
| Castor oil | 2 | „ |
| Neem oil | 3 | „ |
| Chaulmoogra oil | 1 | sr. |
| Caustic soda lye 36°Be | 13½ | srs. |
| Soap green | 2 | dr. |

Now take boiling water q. s. to dissolve :—

| | | |
|---|---|---|
| Ichthyol | 1 | lb. |
| Thyme oil | 4 | oz. |
| Oil citronella | 4 | „ |

Put the oils into a suitable vessel, mix the medicines and stir in the lye. Then add the colour and stir until the mixture thickens. Now pour into the frame.

## TONIC TABLETS

| | | |
|---|---|---|
| Calcium hypophosphites | 50 | grains. |
| Manganese hypophosphites | 25 | „ |
| Potassium hypophosphites | 25 | „ |
| Iron hypophosphites | 25 | „ |
| Quinine hypophosphites | 12½ | „ |
| Strychnine | ⅛ | grain. |
| Potato starch, in powder | 200 | grains. |
| Sucrose, in powder, to make | 350 | „ |

Mix the hypophosphites of calcium, manganese and potassium with strychnine, and grind well together in a mortar. Dissolve the iron hypophosphite in a little water, granulate the mixed powders with the solution, and dry the granules. Powder the dried granules, and pass together with the starch, through a sieve, and make up to the required weight with sucrose. Make into 800 sugar-coated tablets.

## LIME PEPSIN

Pure pepsin 260 gr.; distilled water 3 oz.; glycerine 3 oz.; alcohol 1½ oz.; refined talcum ½ oz.; lime juice, enough to make 1 pint. Mix pepsin with 8 oz. of lime juice. Dissolve in water and add glycerine and alcohol, and finally the remainder of the lime juice. Mix well talcum and let stand for a few days, stirring it occasionally. Filter. This will make 3 seers of syrup. This is a very good preparation for promoting digestion.

### KHUS KHUS ESSENCE

**Procure 12 oz. of khus khus root. Free it from dirt and pound it finely. Now soak the powder in 16 oz. of alcohol and keep into a wide-mouthed stoppered bottle. After a month filter through filter paper and keep in bottles for use.**

### ROOF STOPPING

| | | |
|---|---|---|
| Rosin | 56 | lbs. |
| Paraffin wax | 20 | „ |
| Calcined flint | 40 | „ |
| Raw linseed oil | 3 | gallons. |
| Red lead | 3 | lbs. |
| Wood tar | 3 | „ |
| Salked lime | 3 | „ |

Boil the oil with the red lead, melt in the rosin and the wax. Heat the tar and lime together, add to the oil mixture, then add the calcined flint and thoroughly mix.

### PINEAPPLE VINEGAR

Pare the pine-apple and cut into slices. Pound the slices on a clean stone slab and express the juice. Strain and take 10 srs. Put into an earthen vessel, and apply heat. Remove when it bubbles up and strain when cool. Fill a wide-mouthed jar with it, close the mouth well and place in the sun and dew. After 10 or 12 days a film will form, then strain and put back again in the jar. Finally when the film ceases to appear, strain and bottle.

### BENGAL CHUTNEY

One pound of tamarind pulp, one pound of sultana raisins, the grated rind and half the juice of 12 lemons, one pound of tomato pulp, one pound of minced apples, a quarter of a pound of peeled garlic, six chopped onions, half a pound of red chillies, one pound of ginger in powder, one pound of moist sugar, and four quarts of strong vinegar. Mix the whole thoroughly together and keep it for a month in a warm place to ferment; stir it occasionally, and then put it into small jars.

### ASBESTOS CEMENT

Asbestos cement is generally used when the vessels are exposed to a high temperature and also when the cemented vessels are intended to hold corrosive acids.

I.

| | | |
|---|---|---|
| Asbestos powder | 2 | parts. |
| Barium sulphate | 3 | „ |
| Sodium silicate | 2 | „ |

By mixing these substances, a cement may be obtained which will not be affected by nitric acid. But if the cement is to be exposed to hot concentrated acids, the following mixture is recommended.

II.

| | | |
|---|---|---|
| Sodium silicate | 2 | part |
| Fine sand | 1 | part. |
| Asbestos powder | 1 | „ |

Both these cements take a few hours t[illegible] If quick setting cement is required use [illegible] sium silicate instead of sodium.

### ARTIFICIAL IVORY

Mix 8 parts of shellac with 32 parts o[illegible] monia solution of specific gravity 0.991. shake into solution in revolving cylinde[illegible] about 5 hours. The result of the ope[illegible] will be a complete solution of the consiste[illegible] thin syrup. Add to this 40 parts of zinc [illegible] mix thoroughly with the hand, and then the mixture in a colour-mill. The ammo[illegible] then expelled by heating. The residue is [illegible]pletely dried upon glass plates, ground fi[illegible] a mill, and pressed into moulds with a pre[illegible] of as much as a ton to the square inch, a[illegible] increase of temperature to about 400°F. product when taken from the mould, is pure white colour and closely resembles i[illegible]

### STICK COSMETIC

| | | |
|---|---|---|
| Benzoated lard | 1½ | oz |
| White wax | 3 | . |
| Oil of bergamot | 1 | dr |
| Oil of cassia | 10 | m |
| Oil of thyme | 5 | „ |

Melt the wax, add the lard, and stir creamy; then add the perfume and pour suitable moulds.

### POLISHING JUTE TWINE

The following recipe reproduced fro[illegible] dian Textile Journal is for a size suitabl[illegible] polishing jute twines:—

Starch 8 parts; glucose 3 parts, wat[illegible] parts. Place the starch in a large tub and cold water gradually. Next add the glucos[illegible] it and boil for 20 minutes. Then make borax 1¼ parts, and talc 2 parts, lithopo[illegible] parts, gelatine 3 parts, and water 50 part[illegible]

Heat the mixture in order to dissolv[illegible] borax and gelatine. Then combine the two [illegible]tures well stirring the while, and boil the w[illegible] for 20 minutes. Use when cold. Add sal[illegible] acid 1 per cent. if it is to be kept. Litho[illegible] is a mixture of sulphide of zinc and ba[illegible] sulphate. The following recipes are for suitable for finishing or polishing plaited cords, etc.:—45 gallons of water; 10 lbs. A[illegible] can gum; 1 lb. castile soap; 1 oz. borax; 3 dextrine; 30 lbs. corn starch. Fill up the b[illegible] with 45 gallons of water, and bring to a after adding the borax. Mix the starch in pails with cold water, then add to the b[illegible] again bringing to the boiling point. Mix dextrine in a small quantity of cold water, add this also. Now boil the mixing fo[illegible] minutes, or until thoroughly dissolved. E[illegible] into clean pails and use when cold.

# —READER'S BUSINESS PROBLEMS

Reader's business problems will be discussed in these pages. We invite the reader to write his difficulties. As the department is in charge of an experienced businessman who is ...ially adept in dealing with such problems and to whom experiences of a large number ...uccessful businessmen are available, his replies will lead the enquirer to a successful ...er. These replies will be published in the paper only and cannot be communicated by

### ...ARTING A MAIL ORDER BUSINESS ON SMALL SCALE

...770 K.P.R., Calcutta—Writes how to con... a smalll mail order business.

...he small mail order man does not neces...ly need to make a large success of his ...ness the first year or two for it is then that ...s getting his education in this line, and ...e is little education worth having—be it in ...mail order or any other line—that does not ... time, money and labour. In this respect ...small mail order man differs from the other ...es in the mail order business as it is a ...ular business with them and they cannot ...ord to spend any time or money in the pur...e of experience and so usually enter the ...d with an experienced management or back... or both.

The first attempt that the small mail order ... usually makes in the selling field is in ...ing some novelty that he has reason to ...ve will appeal to some class of trade with ...h he has some acquaintance. Of course ...e are apprehensions of competition in the ... and that from various sources. The large ...logue houses handling nearly every kind of ...ds may compete with him the mail order ...itment of houses which sell by means of ... man should be noted. But there is not ...h danger of coming in contact with these ... classes. The most dangerous competition ... in all probability come from his rival, the ...ll mail order class.

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### ...INCIPLES OF RETAIL BUSINESS

1132 R. L. D. Bombay—Desires to be en...tened on how a retail business can be ...ssfully carried on.

The points which a retailer should bear in ...d in winning new customers and effecting ... may be summarised thus:—

(1) To treat all who enter the shop, ...ther they purchase or not, with the same ...ence and attention as the most favoured ...omer, for they may become such in the ...re.

(2) To meet the incomer with a pleasant ...oming look and word as a gentleman would ...ived an acquaintance at home.

(3) To have an ample supply of sample...s so as to avoid handling goods unneces...ily; but, when the buyer has made a selec...n of what he would like to see, an expert ...ler spares no trouble to give him an ...portunity to examine the goods himself.

(4) A good retailer does not show indifference whether the customer purchases or not, and does not urge him to buy what he does not seem to want nor manifests so much anxiety to sell as to create the impression that there must be good profit in the sale.

(5) A good retailer talks enough to explain what the customer ought to know as to the cause of difference in price and value of various articles of merchandise; but at the same time, he should avoid too much talking especially on outside matters during a negotiation of sale. Discretion in speech is more than eloquence.

(6) A good retailer pays deference to the opinions of the customers and does not make them feel that he knows everything and do nothing.

(7) A good retailer does not enter into contentious argument with customers, nor, when they deprecate his goods, answers back rudely, but either insinuates that they are trying to cheapen the merchandise, or expresses regret that the article does not suit.

(8) A good retailer calls attention of his customers to the special bargains he may have to offer and does not expatiate on them as something unprecedented and wonderful, on the contrary, creates the impression that bargains are nothing unusual or rate in that store.

(9) A good retailer endeavours to ascertain the price the customer expects to pay and does not begin by showing something much higher in prices and superior in quality and then goes down to the grades than can be offered at the price named lest the customer becomes dissatisfied with the inferior quality and wishes to look further.

(10) A good retailer who feels that a price is necessary to effect a sale does not wait for the customer to make an offer but proposes a reduction voluntarily as a favour or for some friendly reason and not as a rule of the establishment.

(11) A good retailer has a quick appreciation of the wants of buyers and does not continue with equal praise on all kinds of style of goods to all persons but catches at the fancy of the customer and presses delicately upon that; or, if it is an unjudicious choice, he points out its defect and produces a more suitable article and thus inspires confidence.

(12) A good retailer as a thorough knowledge of human nature, courteous manners, and a ready tact.

## —BRIEF QUERIES AND REPLIE

**Questions of any kind within the scope of Industry are invited. Enquiries or replies from experts will be published free of charge in serial order. Questions are replied by post on r... of As. 8 stamps for each question. Subscribers outside India are requested to send tw... ternational Reply coupons for each question. In order to facilitate the work of Editor's D... ment and to help prompt action the readers are requested to send enquiries in separate le...**

749 J.N.S., Puri—For pane glass write to United Provinces Glass Works Ltd., Bahjoi, Moradabad and Victoria Glass Works Ltd., 130, Mechuabazar Street, Calcutta.

750 E.M.I., Dacca—We have no book on sheet metal industry. You may however write to Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

752 P.N.P., Umar—For Japanese machine enquire of Chimanlal Desai & Co., 54, Bentinck Street, Calcutta.

753 A.S.F., Jodhpur—Crown corks may be had of Crown Cork Manufacturing Co., 1, Umakanta Sen Lane, Calcutta. For Crown cork making machines enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

754 K.C.I., Khagaria—Process of manufacturing papain will appear in due course. For books enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta. For machine enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

756 N.N.P., Bankura—Process of manufacturing soap will be found in Manufacture of Soap published from this office, price Rs. 4/9/- including postage. Process of manufacturing alta will be found in Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 4/9/- including postage.

757 A.S.F., Karachi—Process of manufacturing lead pencil will be found in Industry Prize Articles Vol. 1 published from this office, price Rs. 2/- including postage. Wirenails are manufactured from wire by means of a machine which may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. You may consult The Plastic Industry price Re. 1/-. You may also consult Chemical Industries of India published from this office, price Rs. 3/9/- including postage.

760 H.N.R., New Delhi Detailed information regarding artificial pearl manufacture is not available.



761 A.P.J., Rohtak—Wood working ... chine may be had of Alfred Herbert (I... Ltd., 13/3, Strand Road and Oriental Mach... Supplying Agency Ltd., P12, Mission Row ... tension; both of Calcutta. Needle ma... machine is not available in India at pr... For needle making machine write to ... Machinery Co., Bridgeport, Connecticut, ...

763 P.S.M.S., Bowringpet—Quillaya ... may be had of Banshidhar Dutt, 126, Kh... patty Street, Calcutta.

765 V.R., Khargpur—All the chem... you require may be had of Calcutta Ch... Co. Ltd., 10, Bonfield Lane and Bansh... Dutt, 126, Khengrapatty Street; both of Cal...

769 B.A.P., Madras—For starting an... of business you require capital large or ... You may start a business with a small ca... but extend it gradually.

770 H.V. Madras—For galvanised ... and fittings enquire of the following fir... Sankar Pipe and Industries Works, 49, Dr. A... Dutt Rd., Howrah; Jogendra Nath Chatt... & Sons Ltd., 21, Maharshi Debendra R... Calcutta 7 and Indian Engineering & Fi... Works, 115, Netaji Subhas Road, Calcutta

772 R.A.E.W., Lahore—Mica sheets ... be had of Calcutta Mica Corporation, 161, ... taram Babu Street, Calcutta and Indian ... Supply Co. Ltd., 95, Lower Chitpur R... Calcutta.

773 P.R.A., Pudukad—Paper pulp ma... books may be had of All India Village Indu... Association, Maganvadi, Wardha, C. P.

775 M.R.S., Ajmer—For blocks enqui... N. De, 1-1, Bhim Ghose Lane, Calcutta.

776 M.T.C., Rangoon—Following ... formula of laundry **blue tablets.** Ultram... blue 6 oz.; sodium carbonate 4 oz.; glu... oz.; water sufficient quantity. Make a ... paste, roll into sheets and cut into tabl...

777 J.S., Chapra—Lead pencils are m... factured by the following firms:—F. N. G... & Co., 12, Belliaghata Road, Calcutta; ... Law & Co. Ltd., 2, Cornwallis Street, Calc...; Hindusthan Pencil Ltd., 428, Kalbadevi ... Bombay and Madras Pencil Factory, 5, St... Street, G. T., Madras.

781 L.S.P., Bhadrak—A good formu... scented sesame or til oil appeared in March ... issue of Industry.

784 D.P.B., Calcutta—Formulas of ... sive paste will be found in April 1951 iss... Industry.

785 S.V.W., Bombay—Following is a ... mula of textile crayons:—French chalk 20 pa... pipeclay 20 parts; white curd soap 6 pa... Make into a stiff paste with water and dr...

786 H.H.S.C., Choharpur—Formulas of ...p, tooth powder, etc. will appear in due course.

787 T.P.M., Calcutta—There is no arrangement for giving practical training in rubber baloon manufacture and ebonite tube manufacture. You should try to be an appren... in a rubber factory.

788 M.I., Calcutta—You may consult Small Industries published from this office, ...e Rs. 2/- including postage. You may also consult our other publications such as Indian Perfumes, Essences and Hair Oils; Home Industries; Manufacture of Syrup and Cold ...nks, etc.

789 M.P.C., Rani—In order to improve ...ncy business you should take agency of known goods only. Then you should approach both wholesale and retail dealers for selling ... articles for which you have taken agency.

791 C.L.K.C., Bulandshahr—Formulas of ...k will be found in April 1950 issue of Industry.

793 Y.N.B.C., Mettur—Confectionery machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Fruit essences may be had of Essence & Bottle Supply Agency, 1..., Radha Bazar Street, Calcutta and Paradise Perfumery House, 7, Colootola Street, Calcutta.

794 J.B., Aligarh—For Kinemascope enquire of Bepin Behari Dass & Grandson, 63F-G, ...dha Bazar Street and Sat Cowrie Dass & Co., 1..., Old China Bazar Street; both of Calcutta.

795 B.U.T.C., Mandalay—Brown colour of ... powder is due to the presence of impurities ... the powder. Impurities may be ordinary ... or iron compound. You have to eliminate ... impurities by washing several times.

798 M.C.M.W., Morvi—Acids are manufactured by the following firms: —Bengal Acid & Chemical Manufacturing Co., 217, Bagmari Road; Bengal Acid Manufacturing Co. Ltd., 66, & 67, Bagmari Road; Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala ...n Road and D. Waldie & Co. Ltd., Clive B..., Netaji Subhas Road; all of Calcutta. ...ate of soda is manufactured by Calcutta ...neral Supply Co. Ltd., 31, Jackson Lane; ...ab Silicate Works, 28, Bagmari Road and ... Durga Silicate of Soda Factory, 22, Bur... Street; all of Calcutta.

799 S.M., Akola—Process of manufacturing ...tric heater coil will appear in due course.

803 N.H.T., Bombay—Following is a for... of transparent paper varnish:—Copal 3 oz.; ...mphor 1½ dr.; Turpentine oil 12 oz.; Oil of ...nder 3 oz. Dissolve the copal and camphor ... the oil of turpentine and then add the oil ... lavender.

804 H.L.R., Agra—For watch straps of plastic enquire of International Sales Corporation, 23/90, Connaught Circus, New Delhi; K. A. Zaveri & Co., 89, Princess street, Bombay.

806 H.S., Bahanpur—For selling beeswax and honey you may negotiate with Banshidhar Dutt, 126, Khengrapatty Street and Indian Herb Store, 31, Mullick Street; both of Calcutta.

807 B.K., Hardwar—For pumps to be used for agricultural purpose enquire of Hassanally & Son, 36, Netaji Subhas Road; Indian Pump Co., 190C, Rashbehari Avenue and Mirlees Watson Co. Ltd., Grosvenor House; all of Calcutta.

808 G.S.R., Calcutta—You may negotiate with the following institute:—Indian Institute of Electronic Technology, 8B, Raja Naba Krishna Street, Calcutta.

813 H.I.C., Gadag—We have no book on refrigeration mechanism. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

815 R.L.S., Kakinada—To communicate with any querist write him with number and initials care of Industry when your letters will be duly redirected.

816 B.I.W., Poona—For saffron enquire of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta and Indian Herb Store, 31, Mullick Street, Calcutta. Addresses of Spain are not available.

818 M.M.A.M., Rambukkana—For fountain pen engraving machine enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

820 A.G.P., Passara—Following is a list of die makers and engravers:—A. B. Sinha & Co., 14, Upper Chitpore Road; Dass Brothers, 14, Garanhata Street, and Art Emporium, 9, Brindaban Basak Street; all of Calcutta.

821 A.C., Kanpur—Vide No. 820 above.

822 A.K., Sharakpur—For glass ware enquire of the following firms:—Balsukh Glass Works, 7, Swallow Lane; Bengal Glass Factory, 106, Khengrapatty Street; Burma Glass Works, 9, Ezra Street; Calcutta Glass & Silicate Works, 9, Kundu Lane and Victoria Glass Works, 130, Mechuabazar Street; all of Calcutta.

823 U.C.C., Kanpur—Pin and clip making machines may be had of Baird Machinery Co., Bridgeport, Connecticut, U. S. A.

828 U.P., Palasbari—You better advertise in newspapers for securing a capitalist partner. We cannot introduce you to any man who will invest Rs. 10,000 in saw mill.

880 M.D.C.C, Calcutta—For transfer labels enquire of Signograph Co., Baranagar, Calcutta and R. G. Pal & Co., 110/2, Grey Street, Calcutta.

831 A.C.B., Jodhpur—Process of manufacturing rubber baloons will be found in Manufacture of Rubber Goods published from this office, Rs 3/9/- including postage. Process of manufacturing naphthalene balls will be found in Manufacture of Disinfectants and Antiseptics published from this office, price Rs. 3/9/- including postage.

833 T.S., Nandyal—We are not aware of synthetic preparation of menthol.

838 S.K.M., Bombay—Your query regarding cuttings should be advertised in newspapers Addresses of translators and commercial magazines in different vernacular languages are not available.

840 D.G., Delhi—Machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension; Martin Burn Ltd., 12, Mission Row; Francis Klein & Co. Ltd., 1, Royal Exchange Place; T. E. Thomson & Co. Ltd., 9A, Esplanade East; and Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; all of Calcutta.

841 B.P.S., Morena—Til oil to be refined is heated with 2 to 5 per cent. of animal charcoal in a vessel over a water bath. This is to ensure that the temperature of the oil is likely to get charred. The whole mass is stirred from time to time so that oil comes in touch with fresh surface of charcoal. The heating is continued for about an hour when the oil is refined. It is then strained through a cloth. You may use sandal oil and musk as fixative agent.

843 B.S., Jarai Kela—Process of manufacturing caustic soda from sodium chloride will be found in Chemical Industries of India published from this office, price Rs. 3/9/- including postage.

844 P.K.A., Trichinopoly — For zinc and tin ingots enquire of the following firms: Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; B. K. Mookherjee & Sons, 70, Netaji Subhas Road and Standard Metal Co., 101, Netaji Subhas Road; all of Calcutta.

852 L.N.D., Jabalpur—All the machineries you require may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta and T. E. Thomson & Co. Ltd., 9A, Esplanade East, Calcutta.

853 J.S.B., Poona — You perhaps mean electrolytic paste which consists of flour, plaster of paris, salammoniac and zinc chloride with enough water to make a paste. Following is a formula of hair cream: White beeswax 10 parts; paraffin oil 130 parts; distilled wat[er] [..] parts; borax 1 part; perfume 3 parts. M[elt] wax in 50 parts of paraffin oil. Place [in] mortar and stir in the remainder of the [..] paraffin. Add the distilled water in whi[ch] borax has been dissolved and stir the [..] formed consistently until cold. Colla[psible] tubes may be had of Metal Box Co. of [India] Ltd., B2, Hide Road, Kidderpur, Ca[lcutta]. Collapsible tube filling machine may b[e had] of Industrial Machine Co., 12, Netaji S[ubhas] Road, Calcutta. Lanoline may be had [of] Butto Kristo Paul & Co. Ltd., 1 & 3, B[..] Lane, Calcutta. Bentonite may be h[ad of] Calcutta Mineral Supply Co. Ltd., 31, J[..] Lane, Calcutta. Agar agar may be h[ad of] Banshidhar Dutt, 126, Khengrapatty [..] Calcutta.

854 L.S.R., Bhadrak—Process of re[fining] till and coconut oil to be used as hair o[il will] be found in Indian Perfumes, Essence[s and] Hair Oils published from this office, Rs. 3/9/- including postage.

859 D.D.A., Andheri — Process of [..] test for ghee will be found in Decemb[er] issue of Industry.

861 M.A.A., Bhongir—A formula o[f] cream will be found in June, 1950 is[sue of] Industry.

862 D. B., Lushai Hills—For ena[mel] nameplates enqire of the following firm[s:] Enamel & Stamping Works, Ltd., 9, Midd[..] Entally, Calcutta and Bengal Enamel W[orks,] Palta, 24 Parganas.

863 R.P.V., Banaras — For drug [..] you may write to the Director, Central [..] Laboratory, Govt. of India, 110, Chitta[ranjan] Avenue, Calcutta.

864 J.N., Puri—Palm oil is not ext[racted] from palm or tal fruits. Palm oil is avail[able in] North and South Africa and in some pa[rts of] Burma.

865 K.T.C., Morvi City—Agarbatti [..] manufactured by the following firms: K[..] Gupta Agarbatti Factory, 6, Apparao [..] Nagarthpet, Bangalore City; Mysore A[..] Dhoop Factory, Kalamma Temple [..] Mysore; Mysore Shah Agarbatti Fa[ctory,] Devaraj Market Bldg., Post Box 31, M[ysore] and Sree Satyanarayana Parimal Fa[ctory,] Jagan-Mohan Palace Square, Mysore. [For] matches of required brand enquire of W[estern] India Match Co. Ltd., Indian Mer[cantile] Chambers, Nicol Road, Ballard Estate, Bo[mbay].

866 U.P.T., Moulmeingyun — Proc[ess of] manufacturing mosquito repelling [..] surti zarda, phenyle, etc. will appear i[n due] course.

867 U.C.C., Kanpur—Process of manufacturing water colour cakes will be found in May, 951, issue of Industry. Following is a formula of sealing wax: Shellac 14 parts; Rosin 24 parts; Vermillion 1½ parts; Barytes 14 parts; Whiting 4 parts; Turpentine 4 parts. Melt the shellac and rosin over a slow fire, keep hot and stir in the pigments. Lastly add the turpentine oil. Cast into sticks. For mould enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

868 K.S.J., Kanjirapally—There is no arrangement for giving practical training in manufacture of carbon paper. You cannot manufacture brushes with the brittle vegetable fibres. Sealing wax making mould may be had of Small Machineries Mfg Co., 22, R. G. Kar Road, Calcutta.

869 V.H.P., Kolhapur—Match making machines may be had of Standard Machinery 86B, Netaji Subhas Road, Calcutta.

871 H. L. J., Delhi—Process of manufacturing black salt appeared in August, 1951 issue of Industry.

873 D.R.T., Bombay—We are not aware of such chemical that will prevent charring of the buttons when ironing

876 K. M. S., Peshawar — Process of mercerising cotton appeared in June, 1951 issue of Industry.

877 S.M.E., Gudibanda — Date seeds are used in coffee manufacture.

878 S.S.R.R.C., Pallatur — Process of manufacturing sago appeared in June, 1949 issue of Industry. For machines enquire of Oriental Machinery Supplying Agency Ltd., Mission Row Extension, Calcutta and Industrial Machineries & Tool Mfg. Co., 11, Ghanantola Road, Howrah. Starch is used as raw material for manufacvturing sago.

879 W.S.C., Karachi—Strawboard may be had of Bharat Straw-board Co., 55, Alli Chambers, Tamarind Lane, Fort, Bombay; and Straw Board Mfg. Co., Saharanpur. For panel pins enquire of Utility Products Ltd., 14, Bentinck Street, Calcutta.

881 D.S.R., Bapatla—Brick and tile making machines and other machines you require may be had of Martin Burn Ltd., 12, Mission Row, Calcutta.

882 K.K.D.C., Belgaum—Refer your query to the Director, Imperial Veterinary Research Institute, Mukteswar, Kumaun, Nainital. For book on chemical industries enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

883 Q.C.W., Ahmedabad—A good formula of sizing agent will appear in due course.

884 S., Lucknow—Process of bluing iron manufacturing lice killer and making ink will appear in due course.

885 A.P.J., Rohtak—For cigarette making machine enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Cotton spinning machine may be had of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta. For safety pin making machine write to Baird Machinery Co., Bridgeport, Connecticut, U.S.A.

887 S.V., Kanpur—Process of nickel plating and chromium plating will be found in Electroplating in Practice published from this office, price Rs. 3/9/- including postage. Process of manufacturing cycle saddle cover will appear in due course

889 B.N.S., Lucknow—For celluloid sheets enquire of A. K. Zainuddin & Co., 122, Bhindi Bazar, Mohamadi Manzil, Bombay 3 and Swadeshi Industries Ltd., 100, Netaji Subhas Road, Calcutta. For mould enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta 4, Acetone may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcuta.

891 B.B.R., Darrang—Following is a list of hardware dealers. B. C. Kumar & Bros., 42, Strand Road; B. K. Mookherjee & Sons, 70, Netaji Subhas Road; B. Roy Bros., 113, Manohar Das Chowk and Bombay Hardware Mart, 82, Netaji Subhas Road; all of Calcutta

892 T.S., Patiala—Creosote oil may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road and Turner Morrison & Co. Ltd., 6, Lyons Range, both of Calcutta.

893 S.L.G., Farrukhabad—You may start a chemist's shop. But before starting the shop you should obtain some experience in the line You may approach manager of a big chemist's shop to be an apprentice to learn the secret of the business.

895 N.D., Srimangal — Lozenge making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Following is a list of lozenge manufacturers: B. C. Datta, 71, Canning Street; C. & E. Morton (India) Ltd., 8, Royal Exchange Place; Empire Confectionery Co., 157, A. Dharamtala Street; James Lord & Sons Ltd., 5, Commercial Bldgs. and U. P. Confectionery, 71/1, Canning Street; all of Calcutta.

897 M.S.B., Chikmagalur—For iron mortar and pestle enquire of the following firms: New India Hardware Mart, 152, Narayan Dhuru Street, Bombay 3; Shah & Brothers, 234, Nagdevi Street, Bombay and Lachmi Hardware Stores, 113, Manohar Das Chowk, Calcutta.

898 G.K., Ranchi—You may take agency of Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Road; Calcutta Chemical Co. Ltd., Panditya Road and Bengal Immunity Co. Ltd., 153, Dharamtala Street; all of Calcutta.

## —REVIEW OF BOOK[S]

**THE THEORY AND PRACTICE OF INDUSTRIAL RESEARCH by David Bendel Hertz, Ph.D., Professor of Industrial Engineering, Columbia University. Published by Mc Graw Hill Book Company, Inc., New York. Pages 385, price $ 5.50.**

The advantages of industrial research are now widely recognised all over the industrialised countries of the world and there is hardly a big industrial organisation without a department for conducting research work. Practically a company which wants to keep up leader-ship in competition with its rivals has got to keep its vigilant eyes on the improvement of its products and processes, and introductions of new ones in the market. New inventions and processes in the domain of pure science are daily coming to light and the possibility of their application to the particular industries is to be worked out carefully. Moreover independent research work is to be always kept in view to further improve the standard of production and to introduce new lines of manufactures. The book under review discusses in a comprehensive way the fundamental basis of research work, both in its theoretical and practical aspects. Although research work is now-a-days being undertaken on a wider scale in India than formerly and National Laboratories have been set up for scientific investigations and enquiries in various lines, literature about the theoretical and practical aspects of this subject is rather scarce. The book throws a flood of light on this subject and as such should be widely read for deriving the best benefit from the research projects and programmes.

The book commences with a brief and intelligent account of scientific investigations from the days of Artistotle and Plato down to the period of Pascal and Laplace and traces the gradual evolution of reasoning processes and development of research methods which form the tools in the hands of modern researchers. The book then proceeds with the magnitude of research in industrial fields like chemicals, dyes, textiles etc. and evaluates the benefits accruing from it to the society.

The special feature of the book is however scientific discussions of the various aspects which are to be taken into account when a particular research work is contemplated. The first step in the scheme is an analysis of the research processes which combines creative mentalities, problems, methods and solution with a view to attaining a rational methodology for the enterprise to adopt. Complexities of the problems under research, the offshoots of the problems, the availability of the raw materials required for the purpose, the selection of a particular method are to be given first consideration. The other factors which are to be considered are the cost of each alternative processes in hand in terms of the final manufacturing cost,' amount of capital which may be available from the company's surplus or from other sources to utilise the results of th[e] research work, the total cost of research w[ork] etc., etc. Another question is whether [the] research personnel is competent to carr[y] [o]n the work in a satisfactory manner. In [this] connection investigations are equally nece[ssary] for research work regarding perfection [of] existing processes and it becomes necessa[ry to] collect market data of sufficient accuracy, [...] and market trends with a view to eval[uate] the proposal. It is needless to say that re[search] work should be reserved for only such pro[jects] as have the chances of highest potential [...]. In concluding chapters of the book the[re are] full discussions for the facilities that will [...] a research worker in solving the pro[blems] delegated to him. A general outline has [been] given of the policy to be followed by a co[ncern] as regards safeguarding its interests by pa[tent]ing and agreements. Finally the importa[nce of] keeping up relationships with sister orga[nisa]tions and co-ordination of work has [been] stressed. We recommend the book highly [to] the notice of all interested in research w[or]k.

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**THE INSURANCE DIRECTORY, 195[...] Edited by Ashutosh Banerjea, Editor, Ins[ur]ance Herald. Published by Chhaya Publisher[s] Ltd., 2/1, Mission Row, Calcutta. Pages 26[...] price Rs. 3/8/-.**

The present volume, like its predec[essors] contains a mass of valuable information [on] t[he] progress of insurance in India. The featu[re of] the book is a comprehensive account sho[wing] the position of the various insurance compa[nies] operating in India along with their schedu[les of] premium rates, summary of revenue acco[unts,] distribution of assets, summary of valu[ation] report, etc., etc. Besides this the book co[ntains] a list of names and addresses of insurers w[ork]ing in India with years of registration, a l[ist of] actuaries in India, and other interesting [...]. An important addition to the book is [the] inclusion of the more important sections [of the] Insurance Act.

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# TRADE ENQUIRIES

**(To communicate with any party write [to] him direct with name and address given bel[ow] mentioning Industry.)**

688 Garsan Commercial Corpo[ration] Sanyogitaganj, Nndore—Wants to know th[e] newspaper of Goa.

[8]11 Master Devi Dayal Tiwari, S[...] Ganj, Bhopal—Wants to be put in touch [with] natural magnet stone suppliers of B[...] Bagdad, Medina, Mecca, Aden, Iran [...] Gwalior State.

845 S. M, Sharif, Idrees Ganj, Ha[...] Wants to be put in touch with the suppli[ers of] dried gut, beef and sheep casings and [...] interested in sinewgut.

986 J. N. Parikh, 3, Mangoe La[ne,] Calcutta 1—Wants to be put in touch with th[e] suppliers of raw bristles, crushed bones, [...]id fleshings and electroplating brushes.

# —IN THE FIELD OF INVENTION

## SAFETY CLOTHING

Special clothing which protects workers a[g]ainst injurious chemicals has been developed b[y t]he Standard Safety Equipment Coy., Chicago. [Th]e clothing coated with a Goodrich Company [pro]duct called yeon resin, is said to hold off the [acti]on of inorganic acids, alkalis, salts, hydro[carb]ons, amines and strong oxidising agents [lon]g enough for the worker to wash and change.

## RECLAIMING ALUMINIUM FROM SCRAP

A mercury extraction process for reclama[tio]n of aluminium from scrap is described.

Normal smelting processes only remove [non]-metallic impurities or coarse metallic mix[tur]es such as lumps of iron from the aluminium [scra]p material. Hot mercury acts as a selective [solv]ent for aluminium in typical alloys. The solu[bili]ty increases with temperature and a value [sui]table for techinical purposes is reached only [ab]ove the normal b.p. of mercury, thus, requir[ing] the use of pressure vessels.

Intermittent extraction in autoclaves was [no]t satisfactory. In the continuous process, an [ope]n hot cold U-tube having a central horizon[tal] hot section and two cold vertical tubes is [em]ployed. The height of the cold tubes is suffi[cie]nt to balance the mercury vapour pressure [of] the hot section. The top portions of the ver[tic]al columns are kept at room temperature to [mi]nimize vapour losses. Wetted crude alumi[ni]um passes in counter-current to the mercury, [th]e concentration being properly adjusted dur[ing] extraction. After solution of the alumi[niu]m and mechanical separation from the re[sid]ue, the mercury passes into a cold zone of [the] U apparatus where it crystallizes out on [th]e surface as a silver-white magma. This is [ski]mmed off and pressed to a cake with 70 per [ce]nt. of the metal. The remaining mercury is [re]moved by melting at 750°C. out of contact [wi]th air. The extraction residue is similarly [tre]ated to recover the mercury.

The process may be used for the production [of] primary aluminium-silicon alloy produced by [el]ectro-thermal smelting of bauxite and coke, [pr]ovided the coke alloy is produced in larger [sm]elting units of 20,000 to 30,000 kw. to make [it e]conomic.

—INDUSTRIAL CHEMIST.

## BLEACHING OF JUTE FIBRE

The rate of bleaching of lignocellulosic [m]aterials with chlorine is greatly reduced by [blo]cking the free phenolic or enolic hydroxyl [gr]oup in the lignin by a methoxylgroup. Par[ti]al acetylation of jute with a mixture of acetic [an]hydride and pyridine as well as methylation [w]ith an ethereal solution of diazomethane has [n]ow been shown to similarly retard the rate of [b]leaching (Nature, 1950, 166, 1040). The ace[ty]lated sample required seven chlorination and sulphite extractions (by the Cross and Bevan method) for isolation of a ligninfree fraction as against three such treatments in the case of raw jute. The colour reactions associated with lignin after chlorination in acid solution and addition of sodium sulphite were much less marked with the acetylated sample. While the non-acetylated material developed an intense red colour in the cold immediately on adding sodium sulphite to the chlorinated lignin the acetylated material had to be warmed and even boiled before any colour developed. Exposure to light, of the partially acetylated jute, resulted in photo-chemical bleaching and loss of acetyl groups from the sample while the raw jute turned yellow or brown. There was no change in the bleaching rates and colour reactions of acetylated jute before and after exposure to the light of a mercury vapour lamp indicating that the acetyl groups removed during irradiation are not those responsible for retarding the bleaching reactions of acetylated jute.

## NEOPRENE AIRDRY COATING

Neoprene, the synthetic rubber made by Du Pont, Washington, can now be applied as an airdry protective coating for industrial maintenance work on structural steel, concrete, wood and exterior surfaces of tanks, and equipment. It is applied by brush or spray gun in a single coat. Outstanding properties are those which distinguish neoprene from natural and other synthetic rubbers exceptional resistance to oil, grease and chemicals; and resistance to agecracking by sunlight, weather and ozone. It also possesses the characteristic properties of any rubber product resilience, elasticity, a high order of abrasion-resistance, and noncracking properties. The new material has now been named Gaco Neoprene Maintenance Coating. An outstanding feature of the air-dry coating is the fact that it develops its desirable physical properties without the benefit of heat.

—CHEMICAL AGE.

## MOISTURE METER FOR TEXTILES

A new British instrument for measuring the moisture content of textiles is based on the fact that a static electric charge develops on warps and cloths of fibrous materials during drying and movement. The magnitude of this charge is related to the moisture content and is independent of the grade and thickness of the cloth.

The electric charge is collected from the full width of the material by means of an electrode which is mounted at the delivery end of the drying machine, the potential being conveyed to a measuring instrument and converted to an indication of the moisture content, and shown by meter and signal lights. Semi or fully automatic control of drying can be operated from this instrument.

—INDIAN & EASTERN ENGINEER.

**PRINTING ON WOOD**

In printing wood special consideration must be taken, because the surface of wood is so absorbent, that a priming coat must always be applied to prevent the ink from soaking in too much. The surface, after being smoothed, is sponged with a mixture of ammonium hydroxylamine hydrochloride, and then with hot water. In case the wood does not absorb water readily, 10 per cent. of glycerin may be added to the hot water.

An alternative procedure involves the use of a coating preparation consisting of a solution of 50 parts of rubber, 30 parts of white wax and 60 parts of Canada balsam in 700 parts of turpentire, 40 parts of linseed oil, and 650 parts parts of benzene. Afterwards the wood may be printed with a fatty ink and subsequently coated with a varnish or lacquer for protection against mechanical and chemical deterioration.

**DEPILATORY CREAM**

396 J.D.S.K., Palm—Wants to have a recipe of depilatory cream and also hair cream.

| | | |
|---|---|---|
| Barium sulphide | 30 | grms. |
| Atropine | 5 | " |
| Spermaceti | 100 | " |
| Distilled water | 200 | " |
| White petrolatum | 300 | " |

Melt over a water bath and mix and put in pots.

This cream can be used as depilatory or can be applied every day for 20 minutes to stop the growth of unwanted hair.

**HAIR CREAM**

| | | |
|---|---|---|
| White beeswax | 10 | parts. |
| Paraffin oil | 130 | " |
| Distilled water | 15 | " |
| Borax | 1 | part. |
| Perfume | 3 | parts. |

Melt the wax in 50 parts of paraffin oil. Place in a mortar and stir in the remainder of the liquid paraffin. Add the distilled water in which the borax has been dissolved and stir the cream formed consistently until cold.

**GREASE CRAYONS FOR WRITING ON GLASS**

537 R.K.G., Dhampur—Wants to have a formula of grease crayons for writing on glass and also glass paint.

| | | |
|---|---|---|
| White beeswax | 40 | parts. |
| Tallow | 44 | " |
| Carmine | 45 | " |

Melt the tallow and add the wax in the form of fine flakes. When the wax is also melted, stir in the carmine and keep stirring until the mass has almost solidified. Then pour it into small waxed paper tubes.

**INK FOR WRITING ON GLASS**

| | | |
|---|---|---|
| Pale shellac | 2 | oz. |
| Venice turpentine | 1 | " |
| Sandarac | ½ | " |
| Oil of turpentine | 3 | fl.o. |

Dissolve by gently heating and then ... ½ oz. of any one of the following pigments:

| | | |
|---|---|---|
| Black | -- | Lamp-black. |
| Blue | -- | Ultramarine. |
| Green | -- | Brunswick Green. |
| Red | | Vermillion. |

**PAINTING GLASS**

Thoroughly clean inside of glass and a... a first coat of a very thin mixture of white ... and turpentine, containing a pint of hard-d... varnish per gallon of turpentine spread rap... on glass with a soft brush and immedi... stipple the paint with a wall stippler.

**SNOW**

548 H.C.P., Bihar Sharif—Desires to k... a good formula of snow.

| | | |
|---|---|---|
| Stearic acid | 24 | lbs. |
| Pot. carbonate | 5 | " |
| Glycerin | 8 | " |
| Water | 12 | gals. |

Perfume with rose, jasmine or comp... scent.

Heat the glycerin, pot. carbonate and wa... together to 200°F. and add stearic acid (... viously heated to 200°F.) to it slowly with ... ring in an emulsifier or whipper. Conti... stirring until the mass is homogeneous. A... to stand overnight. Next add the perfume ... mix for 20 minutes. This cream is softer ... the old-fashioned creams but typifies the hig... grade modern vanishing cream. The pea... ness in this cream increases with age and helped by stirring cold the next day.

**NAPHTHALENE BALLS**

563 A.C.B., Jodhpur—Wishes to have a ... cess of making paphthalene balls.

In order to produce naphthalene balls ... purified naphthalene is carefully melted a... low heat in an ordinary melting pot and la... into the moulds with an iron ladle. Great ca... must be taken in melting the substance beca... at a high temperature it will ignite and b... causing a great loss to manufacturers. ... casting, iron and wooden mould are genera... used. These are made in two halves conne... together with pins; in each half a numbe... hemispherical depressions are sunk in a ... with a tube connecting them all together. ... one end of the mould is a hole drilled for po... ing in the melted mass. On cooling, the liq... is solidified into balls, which may be separat... by breaking off the attached pipe.

**UBBER BALLOONS**

| | |
|---|---|
| Rubber latex 60% | 167 parts by volume. |
| Colloidal sulphur paste 50 p.c. | 3 " " |
| Zinc oxide | 1 part by weight. |
| Piperidine piperidine-1-carbothionolate (accelerator) | ½ " " |

The order of addition of the ingredients is portant, since many compounding ingredi- coagulate latex unless preciously dispersed wetted in water or other emulsifying liquid. above mixings contain very little solid erial and is easily prepared by weighing out accelerator and zinc oxide, moistening these h water or dilute ammonia solution, and ing up with the sulphur paste. This mix- is ground to a smooth cream in a mortar added to the latex with constant stirring uniformly dispersed.

Having prepared a suitable vulcanisable x, this may be utilised for dipping. The ers e.g. glazed porcelain, glass, varnished l wood, be fitted in a frame are immersed the latex bath fairly but the rate of with- wal must be slow and uniform. The for- s after withdrawal are inverted and allowed lry somewhat, and then the necks of the bal- s are rolled up to form collars. The rack n passes to the hot air vulcanisers. The perature of the air and the time of drying l simultaneous vulcanisation are adjusted the capabilities of the accelerator used in mixing.

The final operation in the production of ped goods is that of stripping in which the cle is peeled off the former on which it has n made.

Fresh unvulcanised or imperfectly vulcanis- latex rubber will stock to itself very strong- so that the surfaces can only be separated h great difficulty. Even fully cured surfaces latex rubber show an inconveniently strong esion if pressed into contact; consequently e kind of surface treatment must accom- y the stripping of the dipped goods from r formers to prevent the film from rolling l sticking into wrinkles. Commonly, a al dusting is given with French chalk. It been noticed that where a calcium chloride gulant has been used, fully vulcanised goods be stripped successfully merely by work- a little water between the film and the ner. Where perfect transparency is to be tained articles may be stripped under hot py water and dried without rinsing.

**PPERMINT TABLETS**

587 N.A.K.,—Desires to have a good for- la of making peppermint tablets.

| | | |
|---|---|---|
| Fine sugar | 92 | lbs. |
| Starch | 4 | " 6 oz. |
| Powdered gum tragacanth | 8 | oz. |
| Gum solution | 120 | fl. oz. |
| Peppermint oil | 8 | " " |
| Medicinal liquid paraffin | 2 | " " |
| Talc | 3 | lbs. 2 oz. |

The gum solution which is used as a moistening agent is made up by dissolving 1 lb. 4 oz. powdered gum acacia in 120 fl. oz. of water.

Now mix the sugar, starch and gum tragacanth. Next moisten the mixture with the gum solution. When base is thoroughly moist pass through No. 8 mesh screen on Oscillating Granulator. Spread the wet granules out to dry. When dried sieve again through No. 12 mesh. Transfer the received dry granules to a mixer and add the peppermint oil, liquid paraffin and talc while the mixer is running. The granules will be ready for compressing after about 10 minutes run.

**RECOVERY OF SILVER FROM WASTE FILMS**

619 B.S.T., Hoshiarpur—Desires to know a method of recovering silver from waste films.

To reclaim silver place the old films, plates, paper, etc., in a porcelain dish, so arranged that they will burn readily. To facilitate combustion, a little kerosene or denatured alcohol poured over the contents will be found serviceable.

Before blowing off the burnt paper, place the residue in an agateware dish, the bottom and heat it until the silver is separated as a peter and water. Place the whole on the fire, of which is covered with a solution of salt nitrate.

The solution being complete, add to the mass a little water and hydrochloric acid, when in a short time the serviceable silver chloride will be obtained. If the films should not give up their silver as freely as the plates, then add a little more hydrochloric acid or work them up separately. Silver reclaimed in this way is eminently suitable for silverplating all sorts of objects.

**ENGRAVERS' VARNISHES**

In copper-plate engraving the plate must be covered with a dark-coloured coating which, through entirely unaffected by the etching fluid, must be soft enough to allow the finest lines to be drawn with the needle and must also be susceptible of complete and easy removal when the etching is finished. Varnishes which possess these properties are called "etching grounds". They are made according to various formulas, but in all cases the principal ingredient is asphalt, of which only the best natural varieties are suitable for this purposes. Another common ingredient is beeswax, or tallow.

**Etching grounds are usually made in small quantities, at a single operation, by melting and stirring the solid ingredients together and allowing the mass to cool in thin sheets, which are then dissolved in oil of turpentine. The plate is coated uniformly with this varnish through which the engraver's tool readily penetrates, lying bare the metal beneath. After the lines drawn have been etched by immersing the plate in acid, the varnish is washed off with oil of turpentine.**

The following formulas for etching grounds have been extensively used by engravers:—

| | I. Parts | II. Parts | III. Parts | IV. Parts |
|---|---|---|---|---|
| Yellow wax .. | 50 | 30 | 110 | 40 |
| Syrian asphalt . | 20 | 20 | 25 | 40 |
| Rosin .. | · | · | — | 20 |
| Amber .. | · | — | 20 | — |
| Mastic .. | 25 | 25 | 25 | .. |
| Tallow .. | --- | - - | . . | 2 |
| Bergundy pitch .. | - - | — | — | 10 |

### ALUMINIUM FLUORIDE

625 S.D., Calcutta--Wants to know a process of preparing aluminium fluoride.

A solution of aluminium fluoride is most conveniently prepared by suspending 42 grms. of basic aluminium acetate and 54 grms. of alumina in about 100 c.c. of water and 66 grms. of 40 per cent. hydrofluoric acid. Solution occurs either at once or after boiling for a short time. The solution gradually deposit a gelatinous or colloidal hydrate of aluminium fluoride. The same dilute solution gradually deposits a crystalline crust of a similar composition.

### AMMONIUM BICARBONATE

Ammonium bicarbonate may be prepared by treating an aqueous solution of the commercial carbonate with carbon dioxide gas. It is also obtained by adding alcohol to an aqueous solution of the commercial carbonate.

### COFFEE TABLETS

650 M.S., Nagarett -Wishes to have a formula of making coffee tablets.

Take roasted coffee and grind it to coarse powder by means of a gringing machine. Then mix chicory powder in the proportion of 2 parts of chicory in every 8 parts of coffee or according to the taste of manufacturer. Then put the mixture in an automatic pressing machine and press into tablets. The size and shape of the tablets vary with the manufacturer. So... tablet manufacturers do not add any bin... material, but others add about 15 per ... glucose.



### BRILLIANTINE

693 P.R., Calicut—Wants to have reci... brilliantine.

| | | |
|---|---|---|
| White soft paraffin | 900 | part |
| White ceresine | 100 | ,, |
| Bergamot | 2 | ,, |
| Ionone alpha | 4 | ,, |
| Violet absolute | 1 | part. |
| Heliotropin | 2 | part |
| Vetivert oil | 1 | part |

Melt the soft paraffin and ceresine ... water bath and incorporate the other in... ents one by one. Then remove from the s... of heat and run into pots.

### INK TABLETS

740 G.U.C., G.T., Madras--Wants to ... recipes of ink tablets, candle making, etc.

In making ink tablets take the foll... composition in a mortar and moisten it w... little water as possible. Do not add too ... water which will take a long time to dry. ... put this moist lump over a tray and exp... to dry in the sun for three or four ... When dry break the lump into coarse p... so as to form granules like mustard. ... compress into tablets in a tablet makin... chine.

| | | |
|---|---|---|
| Methylene blue | 8 | oz |
| Methyl violet | 2 | |
| Sugar powdered | 2 | |
| Dextrin | 1 | |
| Boric acid | 2 | d. |

### CANDLE MAKING

| | | |
|---|---|---|
| Hard paraffin | 30 | oz |
| Stearic acid | 17½ | |
| Beeswax | 2½ | |

Melt together and stir until cl... coloured candles are desired a pinch of a... soluble dye is dissolved at this stage. Po... vertical moulds in which wicks are hu...

### PAPAIN

754 K.C.I., Khagaria--Wants to ha... good process of preparing papain.

The best method to prepare papain ... collect the juice of unripe papaw by m... shallow longitudinal incisions about ¼ inch in the well grown fruits, by means of a metallic knife such as a bone or ebonite k...

Fruits in which only three to four ... sions are made simultaneously can be ... again after a day or two. The juice res... a white thin sticky latex which coag... rapidly.

SINESSME

LII. CALCUTTA, AUGUST, 1951.

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*WAR FEVERISHNESS*
*ALL OVER THE WORLD*

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# Industry

EDITOR :

K. N. BANERJEE.

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# STATE ENTERPRISE.

AS years roll on new and difficult responsibilities are being more and more thrust upon the Government, and in coming years Government's functions in the economic sphere are likely to expand. Besides the defence industries which must continue to be run as an integral part of the Governmental machinery on grounds of secrecy, the management of certain key industries which will serve as the starting point of very many small industries will have to be taken up by the Government.

But there is considerable misgiving about the prospects of State enterprise in the public mind. There are many responsible men who strongly believe that the State-managed concerns cannot function as efficiently and profitably as the private concerns. This is so because men who will be commissioned to run the State enterprise have worked all through their life in official capacity and cannot be expected to possess the keen business sense and quick judgment of an Indian merchant long in the business line.

In this event it is necessary to make a critical examination of the conditions which alone can make the State enterprises successful in the strictest sense of the term. This formed a subject of enquiry by Mr. A. D. Gorwalla who has recently submitted his Report to the Planning Commission.

Mr. Gorwalla in his Report admits that private enterprise has certain special advantages over public concerns but thinks that the handicaps to which State enterprise is subject to can be successfully surmounted in process of time by better recruitment, better training and better methods.

In his Report Mr. Gorwalla attempts to devise means for economy in production and quality control of the goods and services in respect of each and every unit under Government management. He lays great emphasis on the selection of proper personnel for the internal management of the unit. Over and above this, he says, modern technique must be adopted and new traditions built up which will combine the best in Governmental and private enterprise.

*(Continued on page 206)*

# —CURRENT TOPICS

**EN-YEAR AGRICULTURAL PLAN**

While the food position of the country ince partition of India is causing a good eal of headache to the Government in ower, our thoughts turn back to the big eports eulogising activities of the various Agricultural Departments and their chievements towards speeding up agricultural production. We have been told f the improved strains of rice and wheat volved in the laboratory, that would solve he food problem. But as matters stand here is a wide gap between the laboratory nd the field which should be bridged nmediately for the benefit of the country. There is a growing consciousness on this oint in Government circle. What is the ood of evolving high-yielding and disease-esistant seeds, if the researches remain losed in office files. A ten year scheme is nder contemplation that will altogether ansform the agricultural economy f the country and will engender an nthusiasm among the peasant class for he introduction of better seeds and exension of cultivation. · Concrete targets o be achieved for this programme of land ansformation in the next ten years are: Concentration of efforts on 48 million acres of irrigated land, reclamation of 10 million acres of land for new cultivation, provision of 60,000 stud bulls a year, organisation of Land Army in a lakh of villages and addition of 30 crore trees. In several states some villages have already been taking to collective village organisation. This passing enthusiasm should be harnessed into a disciplined and organised effort, if the scheme is to be put on a sound basis.

**FIVE-YEAR PLAN**

The draft outline of a five-year plan by the Planning Commission envisages an outlay of Rs. 1,793 crores on development programmes. The Plan is divided into two parts. The principal emphasis in the Plan is on agriculture and irrigation. This is explained by the serious view which the Commission takes of the country's food problem. If the per capita availability is to be raised to 14, 15 or 16 oz. per adult, the additional production required would be 8.2, 12 and 15.8 million tons, respectively. These figures indicate the

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(Continued from page 205)

There is another outstanding point on which Mr. Gorwalla lays special emphasis. He thinks that although the management of the State enterprise will be answerable to the Parliament and Ministry concerned, there should be machinery for allowing organisations to run without too much interference from those quarters. Mr. Gorwalla suggests that the Parliament should be afforded every opportunity to discuss the working of the concerns when the annual accounts and reports are presented before the Parliament and that there should be checks in the shape of Consumer's Councils and Price Tribunals to enable judgment being passed on the success or failure of State enterprise. There should also be a proper system of cost accounts and of quality control and maintenance of commercial accounts which should be periodically audited by the Auditor General.

magnitude of the task that lies ahead and of the effort which is called for.

The first of the Five-Year Plan contemplates expenditure of Rs. 451 crores on irrigation and power schemes. The total cost of projects included in this part of the Plan is Rs. 729 crores of which Rs. 138 crores have already been spent. The projects are calculated to irrigate an additional area of 8.7 million acres by 1956 and to provide additional power amounting to 1.1 million kilowatts. This will increase the irrigated area of the country by 20 per cent. and the power potential by 70 per cent. over existing capacity. On completion, the projects are expected to irrigate an additional area of 16.5 million acres and to increase the power potential by nearly two million kilowatts.

The programme of irrigation and power development, the Commission suggests, has to be viewed in terms of a major long term objective. This should be over a period of 15 to 20 years to double the area under irrigation and to secure additional production of power amounting to 7 million kilowatts. It is by utilising available resources for irrigation and of power on this scale and by the adoption of intensive measures for improving the standard of agricultural production and the promotion of cottage, small-scale and large-scale industries with the help of cheap electric power, that an appreciable rise in the standard of living can be achieved.

Reviewing the industrial development which has taken place in recent years, the Commission sets forth the following main aims for Five-Year Plan for industry: (1) Meeting the demands for industrial products on account of schemes for agricultural development and expansion of irrigation and power; (2) Fuller utilisation of existing capacity of producer goods industries like jute, and consumer goods industries like cotton, textiles, sugar and soap; (3) Expanding the capacity of industries producing pig iron, steel, heavy chemicals, etc., which are of basic importance to the general economic development of the country; units on which a part of the capital expenditure has already been incurred; (4) Removing the lacunae and drawbacks in the existing industries.

A number of measures for the development of small-scale industries are suggested by the Commission, for instance, establishment of small-scale units at suitable locations for producing steel casting, evolution of small spinning machines for production of yarn and establishment of trading estates at selected centres where cheap power and transport facilities are available.

For the organisation of cottage industries, the Commission relies mainly on industrial co-operatives and on non-official organisations engaged in constructive work in the field of cottage industries to be developed. A programme for rural cottage industries has to aim primarily at assisting the artisan to remove the deficiencies, e.g. lack of organisation, local demand, efficient methods, material and finance and at additional measures such as appropriate stores purchase policies.

**LIME-STONE DEPOSITS IN RAJASTHAN**

Rich deposits of limestone, covering an area of nearly 25 square miles have been discovered at Chittore in Rajasthan. It is estimated that the quarries will yield sufficient quantities of limestone to enable the installation of a plant at the site for the production of 1,000 tons of portland cement a day. At present this limestone is being used for the manufacture of paving and flooring stones.

**U. S. ECONOMIC AID TO INDIA**

New details are now available of America's programme, of economic aid to

South-East Asian countries in the coming year. The programme, costing 80 million dollars, provides for assistance to India, Pakistan, Afghanistan, Ceylon and Nepal in the following manner:—

India: Extension and improvement of agricultural production by the reclamation of unused land, by use of better seed, implements and farming techniques, building of fertilizer plants, and the sinking of tube-wells. American assistance in a fisheries project and geological survey work also was contemplated.

Pakistan: Improvement of agricultural techniques by the introduction of American extension method, improved implements and greater use of fertilizer. Assistance also was contemplated in reclaiming land, introducing modern road-building methods, opening new trade schools and in carrying out a geological survey.

Afghanistan: Assistance in supporting a number of economic development programmes already introduced by the Afghanistan Government, in distributing coal to the Kabul area.

Ceylon: Expert assistance in Ceylon's own programmes for agricultural extensions, water resources survey and the production of educational and training films.

Nepal: Technical advice for raising the low agricultural yield and to survey Nepal's mineral resources.

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**ROAD DEVELOPMENT IN WEST BENGAL**

It appears the West Bengal Government has made good progress in road development within the past three years in face of grave difficulties. According to a representative of the Statesman (Calcutta) who had a talk with the Government official on this matter it appears that 1,500 miles of road are now under construction in the 14 districts of the State. Of the 19 bridges totalling 5,440 running feet, the construction of which was taken up since 1949, two have already been opened to traffic. They are over the Rambijhora in Darjeeling and the Jamuna at Gaighata (24-Parganas). A third bridge at S..t. mile on the Contai-Belda road in Midnapore district is nearing completion. The wells and piers of the remaining 16 bridges have been constructed; their superstructures are expected to be completed next winter and all these bridges will be opened to traffic by June 1952. Plans for the construction of eight other bridges are under consideration. The total estimated cost of the 5 year programme is Rs. 26 crores.

Some idea of the colossal amount of earthwork which has had to be done during the past three years may be had when it is realized that for one mile of road nearly 500,000 cub. ft. of earth are required. Another handicap in the way of road making is the non-availability, at economic rates, of stone in all parts of West Bengal. To meet the shortage, roads have had to be constructed by laying a double soling of bricks with a layer of jhama (broken hard burnt bricks) over which a stone metal coat is laid to a depth of 3" to 4" according to the importance of the road. Over this formation a bitumen carpet is laid or a 4" concrete pavement is constructed. This method gave rise to its own problem, namely, that of supplying bricks (roughly 600,000 to a mile). About 125 kilns were opened in several districts in 1949-50 and a similar number in 1950-51. The programme also included the provision of a large number of ferries and the improvement of existing ones at the numerous river crossings in the State where the erection of bridges would not prove economical. A considerable number of concrete culverts, small but nevertheless tedious in construction, had also to be built.

## MATERIAL RESOURCES

1 view of the extreme shortage of materials all the world over, a monwealth Ministers Conference will ld in London late in September to ss this problem. The meeting will der the problems of production and y of raw materials and of manufac- goods. Among the countries likely e represented are Britain, Canada, , Pakistan, Ceylon, Australia, New ind, South Africa and Southern esia. It appears that a suggestion been made that a permanent orga- ion on a ministerial level be set up to der pooling and allocating strategic scarce materials. India, Pakistan and on which are collectively the largest monwealth producers of raw mate- particularly rubber, jute, cotton, ganese, wool and hides and skins are sed to the suggestion. They f the view that in the interest of equit- trade and economic stability, the out- of raw materials from their countries e rest of the Commonwealth should lanced by an inflow of capital goods the more industrialized sister nations. so appear, that the London Confer- agenda will cover short-term as as long-term supplies of raw mate- but is likely to provide additional rtunity for closer Commonwealth eration.

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## LOPMENT OF AGRICULTURAL PLEMENT

'he Planning Commission recently had iltation with the representatives of Agricultural Implements industry and dered the future development of agri- ral implements and machinery to suit rowing needs of Indian agriculture.

: was early suggested that a survey ld be undertaken to determine the of implements suited to different soil conditions in the country. The sur- vey team should consist of an agronomist, a soil physicist and agricultural engineers and a representative of the agriculturists.

Regarding the present difficulty about the manufacture of adequate quantities of indigenous and improved types of machi- nery, a suggestion was made that some steel processing industries might jointly sponsor the setting up of a blast-furnance plant.

It was revealed at the meeting that there are at present 231 factories engaged in the manufacture of improved types of implements with a rated capacity of 40,000 to 50,000 tons of steel consumption on single shift working. There are also eight organized units engaged in the manufac- ture of power-driven pumps with an an- nual installed capacity of about 33,000 pumps of varying sizes, and five units en- gaged in the manufacture of diesel engines with a capacity of 5,300 engines of differ- ent horse-power. The number of power- driven pumps produced in 1950 amounted to 31,000 and that of diesel engines 4,600. In addition, certain firms imported agricul- tural tractors and implements while a few others manufactured tractor implements.

Statistics relating to imports of agri- cultural machinery and implements show that in the pre-war period, the average annual imports of agricultural machinery came to Rs. 100,00,000. After the war, there has been a steady increase in imports, amounting to Rs. 900,00,000 in 1948-49 and Rs. 16.5 crores in 1949-50.

Imports of diesel engines during 1949-50 formed 50 per cent of the value of total imports, while tractors and parts accounted for 31 per cent. It was esti- mated that during last year 4,000 to 5,000 tractors were imported and the demand was likely to increase from 10,000 to 15,000 tractors per annum during the next few years.

As for diesel engines, the requirements for irrigation purposes were estimated at 30,000 engines per annum, while the present capacity was stated to be 5,300 engines. In addition to plans for expansion of existing firms, four new firms have been allowed to set up plants for manufacturing diesel engines.

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**UTILISATION OF BAGASSE**

Two important bye-products of the sugar industry are bagasse and molasses, which for the best interests of the industry require to be utilised properly. Chemically bagasse consists largely of cellulose and pentosans, both of which are elaborate compounds of sugars, and it is related to cereal straws, maize stalks, and other agricultural residues, industrially exploited in many countries. Bagasse itself is made into insulating material and hardboards for buildings in the U. K., the U. S. A. Hawaii, and Australia. In Barbados, it is mixed with lime and moulded into prefabricated "megacrete" units which are used for building house. Bagasse can also be utilised in the manufacture of cardboard and lining materials. These products make excellent packing containers and are in commercial production in America. And even paper of various types, can be made, both exclusively from bagasse and by mixing it with other pulps. Some promising small-scale results in this field were obtained in Formosa during the war years and, in 1950, the U. S. A. produced newsprint entirely from bagasse.

Further, its cellulose component, for instance, provides an "ennobled" substance, called alpha cellulose, which is the basic raw material of rayon, nitrocellulose, and if sufficiently pure, of cellulose acetate plastics. The sugar compounds of bagasse can be chemically split up to produce two "simple" sugars, dextrose, and xylose. The former is easily fermentable to an alcohol, with numerous important industrial uses, while xylose can be converted into furfural, which can be utilised extensively in the production of oil, synthetic rubber, plastics, and nylon among others. One of the important uses of bagasse plastics, for which plants are being set up in the U.S.A., is in the manufacture of laminates—special products made of various materials bonded together by synthetic resins.

In this connection mention may be made of the fact that in the U.K., an important industry has been developed to ferment molasses, which is another bye-product of sugar industry, into acetone and butanol. Other fermentation processes also yield such useful chemicals as citric, lactic, and aconitic acids. The aconitic acid, a "possible starting material" for synthetic rubber and plastics manufacture, is present in sugarcane juice, and the economic processes for its recovery from molasses have been developed in the U.S.A. Edible yeast can also be produced directly from molasses. Molasses is also stated to have considerable nutritional value, as they are rich in iron and calcium, and can be easily made to prepare a wide range of "very attractive human foods."

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**TAMARIND SEED KERNEL FLOUR**

Investigations carried out at the Indian Jute Mills Association Research Institute, Calcutta, have shown that tamarind seed kernel flour can be used with advantage for the sizing of jute yarn and fabrics in place of the usual starch sizing material. It is estimated that some 66,000 tons of this flour may be available and this quantity would be able to meet the total requirement of sizing material for jute and cotton industries. The studies show that the material is quite satisfactory for use in jute sizing.

## —PROBLEMS IN STEEL ANALYSIS.

RECENT years have seen the solution to many of the difficulties encountered in the analysis of steel but a number of long-standing problems still exist. Some of the more important of these were described and the work being directed towards their solution outlined by Mr. B. Bagshawe, of the Brown-Firth Research Laboratories, Sheffield, are summarised in this article for the benefit of chemists engaged in steel factories.

A practical solution is still awaited to the problem of operating the combustion sulphur process on a stoichiometric basis. Such a solution would be a most important development, as other sulphur determination methods are open to question. Methods based on hydrogen sulphide evolution are becoming more restricted in scope and use. Serious discrepancies arise on certain types of alloy steel, for example, copper and molybdenum steels, and the yield is also affected to some extent by the nature of the sulphur constituents in the metal, and the conditions of heat treatment.

The classical barium sulphate gravimetric procedure is open to error; in very low sulphur ranges, for instance, recovery is almost invariably incomplete. Various devices have been used to encourage maximum recovery, such as addition of known amounts of standard sulphate solution, but these have not been entirely successful. The process also suffers from inconsistency of blank values, which are often of comparable magnitude, to the amounts of sulphur being determined.

### COMBUSTION PROCESS BEST

When much chromium is present the barium sulphate process is practically useless, due to the formation of complex chromo-sulphuric ions which are rot precipitated by the barium ion. Complexing of the chromium with acetic acid or other complexing reagents may help in this direction. Oxidation of chromium to chromate will precipitate insoluble barium chromate.

The combustion process and its properly regulated operation is really the key to the solution. Its many attractive features include speed, convenience of manipulation, and above all, the fact that it may be applied to the widest range of steels and ferro-alloys. If only the problem of the yield factor could be solved, then there is no doubt that, as far as steel is concerned, all other methods would be abandoned forthwith.

In the most recent form of combustion apparatus soda asbestos is replaced by a silica gel dryer. A rubber suction ball is also incorporated to permit the absorbent to be drawn up the delivery tube for rinsing purposes, giving an increased titre of 0.2-0.3 ml. Other developments include the use of enclosed 'cartridgetype boats, which permit a more concentrated reaction with less slag spatter.

### MODERN IMPROVEMENTS

Elimination of all filters and plugs of cotton wool, asbestos, or glass wool, and the simplification of the delivery part of the system are important recent strends. These modifications are possible, since the carry-over of ferric oxide dust can be prevented by presintering the sample before admitting oxygen.

Sintering for periods of two to five minutes is most effective, and the ferric oxide dust is retained in the hot combustion zone, where it is not likely to hold or fix sulphur. The deposition of iron oxide in colder parts of the system, as would otherwise occur, is likely to fix and retain

sulphur gases, and thus markedly affect the yield; this deposition is one of the causes of progressive yield drop during the life of a tube, the yield showing a maximum with a perfectly clean new system and slowly falling as the tube becomes fouled with slag and oxide adhesions.

Use of a refractory plug in the furnace is a great help in retaining ferric oxide dust in cast iron sulphur determinations. The combustion boat must be more than 1 in. from the plug, otherwise molten ferric oxide causes choking.

One of the probable causes of low sulphur recoveries is that some of the sulphur trioxide formed may pass through the absorption system as an unabsorbable mist.

Carbon determinations have not presented any real difficulties for some time as all general needs have been met by the dry combustion procedure. Modern developments in the production of super-pure iron and 4 per cent silicon iron, where carbon contents exceeding 0.01 per cent become of critical metallurgical importance, have served to emphasise the deficiencies of this conventional procedure for these specialised needs.

To a lesser extent this is also true of the Special Steel Industry where carbon specifications of 0.03 per cent (max.) are being laid down for certain classes of stainless iron and steel. As a result, carbon determinations expressed to the third and fourth decimal place are being demanded.

### COMBUSTION PROCESS MODIFIED

An attempt has been made to meet the present urgency as far as low carbon stainless steel is involved, at the Brown-Firth Loboratories by developing a scaled-up version of the normal combustion process. Carbon combustions are at present being carried out on 16.362 g. of stainless steel. which amount is six times the normal factor weight of 2.727.

The conventional apparatus has a [illegible] producibility level of about ± 0.01 per ce[illegible] For work in low ranges the process is [illegible] much affected by blank variation, [illegible] errors are incurred due to computing [illegible] weight differences from weighings of [illegible] mass, for example, absorption [illegible] 100-120 g.

A large tube 30 in. long with an int[illegible] diameter of 1½ in. and operating at 1,2[illegible] 1,300°C. is used in the scaled-up comb[illegible] tion system. The boats are of larg[illegible] (4¾ in. by 1⅛ in. by 5/8 in.) and accomm[illegible] date the full charge of 16.362 g. of [illegible] drillings or millings. The boats are [illegible] ignited at 1,200°C. before use, and giv[illegible] residual blank of only 0.0004 g.

The absorption system includes an o[illegible] size Arnold bulb, containing chrom[illegible] sulphuric acid to absorb sulphur gases, [illegible] the $CO_2$ absorption bulb of Midv[illegible] pattern is of specially small design, 4 in [illegible] ¾in. so that its total weight when pack[illegible] with soda asbestos is only about 30 [illegible] Combustion under these conditions is ste[illegible] and placid and the exothermic heat fr[illegible] such a large charges ensures the compl[illegible] fluxing of the whole mixture. The flux [illegible] 7 g. of red lead, pre-ignited before use [illegible] 450° C.; after this treatment the red le[illegible] blank does not exceed 0.0003 g.

Total blank in the process is only ab[illegible] 0.7 mg., and the carbon equivalent of t[illegible] on a 6 x factor weight charge is only 0.00[illegible] per cent. carbon. Reproducibility is e[illegible] maintained at ± 0.002 per cent. for ro[illegible] operation of large batches.

Other possibilities for development [illegible] conductimetric measurements after ab[illegible] tion in barium hydroxide, and the develo[illegible] ment of radio frequency or induction co[illegible] bustion units.

For research purposes, determinatio[illegible] in the fourth place, for example ± 0.00[illegible] per cent., can be obtained by refin[illegible] methods of measurement, such as the k[illegible]

pressure method in which the $CO_2$ evolved by combustion is trapped by freezing in liquid oxygen and then released in a vacuum system, where it is collected and evaluated manometrically.

Determination of carbon in steels by the copper-potassium chloride method, while not obsolete, is not entirely satisfactory, as recovery of both elements is incomplete. Again, the procedure of dissolving the steel sample in copper-potassium chloride solution is too time-consuming to be of use in routine steel analysis.

### ESTIMATION OF TIN

The most common method for determining tin consists of reducing it in the steel solution either directly or after a separation as sulphide, the reduction being effected with a metallic reductant; the reduced tin is then titrated with standard iodine or iodate.

Metallic reductants for tin include antimony, aluminium, nickel, lead and iron, but the bone of contention at the present time is the relative merits of the antimony-aluminium and nickel reduction procedures. By antimony-aluminium reduction is meant reduction with aluminium metal in presence of a dissolved antimony salt. This is rather a different case from metallic antimony reduction which has been rejected by Evans and other workers.

Objection to antimony is that the reduction accuracy is a critical function of antimony particle size; a coarse antimony gives low results due to incomplete reduction, and a finely ground flour gives high results may be obtained at will, merely by altering the grading of the antimony flour, and correct results are mainly a matter of chance.

By using a combination of aluminium metal with an antimony salt in solution, metallic antimony is precipitated in solution in the form of a sponge of uniform characteristics, and it is possible to control the reduction so that only a slight excess of antimony metal persists through the boiling interval for reduction.

Evans has reported that as much as 8-9 per cent. of the tin present may be lost in the antimony residues, although this is not the case for the very small amounts of tin involved in steel analysis; indeed, proved and tested methods have been put forward in turn for plain and low alloy steels, for highly alloyed steels and finally for ferrotungsten, by official *Bisra* committees, and approved by *Bsi.*

In spite of this, however, the antimony pro-nickel school has many adherents. The experience of the industry sub-committee, which carried out the tin investigations, was that nickel reduction (using an etched and activated spiral) was relatively slow, and that the reduction was often uncertain and incomplete if the spiral was not properly activated by etching in strong salt solution. Another point was that the green colour of the solution of dissolved nickel salts impaired the sensitivity of the end-point.

### COBALT DETERMINATION

An improved method for determining substantial percentages of cobalt is required. The nitroso R salt absorptiometric procedure is easily the best available, but it is best adapted to a moderate range of cobalt content, and, in order to extend its use over the wider range required, semi-micro fractions must be used.

The classical gravimetric procedures are few in number, restricted in scope, tedious in operation and poor in performance. The *a*-nitroso-*B*-naphthol method, for example, is completely unselective. Residual unremoved iron and chromium, and also copper, are precipitated with the reagent. Finally, the cobalt residue is of uncertain composition, and the ignition

product, while weighed as $Co_3O_4$, often contains CoO.

Precipitations as cobalt sulphide are not possible if nickel is present; again, the ignition product is of doubtful composition and may contain residual sulphur compounds, such as $CoSO_4$.

Electrometric titration with potassium ferrocyanide in ammoniacal citrate medium is probably the best alternative to the nitroso R salt procedure. Some workers claim satisfactory results in the analysis of Kovartype materials (Ni, 30 per cent.; Co, 17-18 per cent.), although the process requires empirical calibration and for certain steels involves a rather doubtful manganese correction.

The dimethylglyoxime reaction, with or without cyanometric titration, meets most requirements for nickel determinations, but the most pressing need is for good separation from cobalt. Cobalt interferes in glyoxime precipitations, contaminates the precipitate and may cause partial suppression of precipitation; interference is controlled by oxidation with hydrogen peroxide to the cobaltic state, but this fails then the cobalt/nickel ratio is unfavourably high, with the result that determinations of small amounts of nickel in high cobalt steels are uncertain and unreliable.

With Kovar-type materials, the cobalt contamination problem is acute. X-ray examination shows that the precipitate consists of two phases—the nickel dimethylglyoxime complex and an iron-cobalt complex. This, however, only occurs when the iron is present in its higher valency state. A complete separation can be effected if the iron is first reduced to the ferrous state with sulphite.

Copper interferes to a lesser extent. Thus, large amounts cause partial inhibition of the nickel reaction, and large amounts of glyoxime reagent must be added, while contamination of the precipitate with copper occurs at quite low cop concentrations, and this necessitates petitive treatments.

### BORON DETERMINATION

Determination of traces of boron, example, 0.005 per cent., is one of most difficult of analytical problems. The classical method, consisting of volatil tion of boron with methyl alcohol and ti tion of the distillate with standard sod hydroxide, is quite unsuitable for the r amounts added to steel.

Choice of methods is restricted t very limited range of rather unsatisfa colour reagents, such as quinali (1: 2: 5: 8-tetrahydroxy-anthraquin and curcumin or turmeric.

Quinalizarin is of unstandard quality, and results can only be relat calibrations prepared for each bottle of reagent. The reagent must be prepare strong sulphuric acid, 90/98 per cent. c centration, and variations of perform appear to be critically related to m variations of sulpuric acid concentratio

A pronounced purple colour is exh ed by the reagent solution itself, and blue boron complex must be measured comparing gradations of colour from pale-purple of the reagent itself to d blue, which occurs at about 0.1 mg boron per 100 ml. This is equivale 0.01 per cent. boron on a 1 g. steel b and therefore all amounts below this must be measured by matching mod tions of the purple reagent base colou

### CRITICAL CONTROL NECESSARY

Curcumin, the alternative reag develops a red colour with boron on eva ration to dryness to hydrochloric acid s tions after treatment with oxalic acid. red colour is then extracted with alc and compared against a prepared stand series. Very critical control of rea excess is necessary, as the red boron c

x is modified by the orange yellow our of the reagent itself.

There are also difficulties of application h both these reagents such as loss of atile boron compounds during solution, difficulty of concentrating or evaporat- solutions other than in alkaline d m, pick-up of boron from glassware, l so on.

Procedure based on that of Rudolf and Kinger is the simplest, and consists of ution of the steel with sulphuric acid r reflux, after which the ferrous sulate is salted out in 95 per cent. sulphuric l and quinalizarin added to the concented extract. Alloy steels giving coloured t solutions, for example, chromium steel, ure a separation procedure, mercury hode electrolysis affording a good aration from boron; separation of iron, omium, etc., from boron is also made h sodium hydroxide, and this is the aration which normally precedes the lication of the curcumin reagent.

The usual gravimetric methods, based hydrolytic precipitation as tungstic d and ignition to the oxide are of ibtful accuracy for the determination of all amounts of tungsten in steel. Below out 0.2 per cent. recovery is usually remely poor and amounts of the order 0.1 per cent. or less may escape notice rely.

Various expedients have been tried in ler to improve the yield, but without rked success, and it is noteworthy that st of these devices lead to increased recipitation of molybdenum. In the sence of molybdenum it is easier to just the conditions to provide a quantitative yield of tungsten.

Molybdenum contamination is influenced by a variety of factors, such as concentration of the two elements in lution, the ratio of their respective concentrations, the acidity of the solution and the use of organic precipitating or flocculating agents.

Conditions which favour a quantitative yield of tungstic acid also favour increased molybdenum contamination. Thus minimum acidity, sulphurous acid hydrolysis from a ferrous solution, cinchonine, rhodamine B, and so on, all improve the tungsten yield, but the residue is liable to contamination from molybdenum, particularly when large amounts of both elements are present.

On high tungsten/molybdenum steels the contamination is so serious that in applying the B. S. rhodamine B procedure to high speed steels (7 per cent W, 4 per cent Mo) 12-25 mg. of $MoO_3$ have been found in the $WO_3$ residues.

The ideal reagent for tungsten must, therefore, be not only more efficient than existing ones as a tungsten precipitant, but it must also be more selective. It must as well be capable of application under conditions which permit control of molybdenum coprecipitation, it must, for example, operate at a relatively high acidity 1-2N with respect to hydrochloric acid and be effective in an oxidised iron solution.

In the meantime, the existing procedures are reasonably satisfactory for medium and high tungsten content ranges, and in the absence of much molybdenum.

Apart from this, there is the dithiol absorptiometric procedure, which meets the most stringent accuracy requirements down to the lowest content levels, but is rather complicated in operation for regular use as a routine procedure on batch control.

**TUNGSTEN DETERMINATION**

Tungsten may be determined in the presence of columbium by the dithiol procedure, the columbium being separated by treatment with phosphoric and sulphuric acids.

Methods based on the tungsten-thiocyanate colour have also been used extensively in recent years. It is certain that

this reaction is critically affected by variation of conditions and the most exact and rigid standardisation is necessary. The most recent version of this method to be tested by the physico-chemical analysis subcommittee of *Bisra* as shown real promise; in this procedure the reaction is carried out in hydrochloric acid (1:1), and titanous chloride is used to reduce the thiocyanate complex. There is interference if much molybdenum, copper or vanadium are present.

Polarographic methods have not yet been developed for the determination of tungsten in steels. So far, only lead and copper have been determined in this way.

Molybdenum is still determined by the old caustic soda lead molybdate process and by the α-benzoin oxime precipitation method. The application of both these methods is becoming restricted by the interference of residual tungsten.

Residue treatment to remove co-precipitated tungsten is extremely difficult and it is therefore not surprising that steel chemists are turning to the thiocyanate absorptiometric process.

This method is dependent on a somewhat critical balance of reagent concentrations, and at very low molybdenum concentrations the bleaching of the corresponding ferric thiocyanate colour is erratic and incomplete. There is always a small residual ferric iron colour in the lowest ranges, and this accounts for the irregularity of the curve near the point of origin.

Determinations in the lower range are subject to iron blank values of comparable magnitude to the amount of molybdenum present, with the result that determinations in the region of 0.02 per cent or less are of low accuracy, and may be as much as 100 per cent in error. This residual iron blank can be reduced by increasing the stannous chloride concentrations.

**INSOLUBILITY CAUSES INTERFERENC**

Interference from copper occurs, h ever, due to the insolubility of cupr thiocyanate, and this becomes marked with increasing stannous ch concentration. The problem, therefor to find the best compromise betwee reduction of iron blank and the inc of copper interference.

Use of titanium salts is now investigated by the Brown-Firth La tories. These salts appear to cataly spontaneous and complete bleaching ferric colour and permit the most favou balance of stannous chloride and thio concentrations to be used.

Mercury cathode electrolysis is re applied to steel solutions for a variet purposes, but its full exploitation stil in the future. Present work in the Br Firth Laboratories is being dire towards the development of an appa capable of removing as much as 10 g iron chromium, nickel, etc., in a matt one to two hours. Several difficulties been encountered particularly with c mium-rich solutions, but a point has reached where satisfactory conditions be specified for steels soluble in sulph acid solution.

**SOME FURTHER PROBLEMS**

Further problems include the treat of carbide residues from alloy steels the application of solvents other sulphuric acid; particular difficulties in oxidised ferric solutions. If these p lems can be solved a field of great scop be opened up, particularly in the dete nation of residual and trace amoun elements such as aluminium, titan zirconium, vanadium, calcium, etc.

As regards the determination of alu nium in steel, the aluminium may determined by precipitation as the p phate after mercury cathode electrol The procedures of Gentry and Sherrin

(1946, 1950) using a 1 g. sample have, however, given satisfactory results. Here aluminium oxinate is formed, extracted with chloroform, and the absorption of the extracted solution measured. The aurine tricarboxylic acid procedure is unsatisfactory.

In miscellaneous determinations it must be emphasised that considerable segregation of lead often occurs in steels. Hence, lead should always be estimated on at least 10 g. samples, though some workers continue to use 1 g. samples. The folly of this latter procedure may best be illustrated by a recent case where a bar of steel of about 1 in cross section and 1 ft. in length gave on analysis no lead reaction at one end and 0.25 per cent of lead at the other. Steels made by the Ledloy process, however, are less likely to suffer from segregation.

The most satisfactory method for the determination of oxygen in steels is that based on vacuum fusion. Methods based on aluminium reduction either in hydrogen or in vacuo are not very popular, as the blanks often give trouble.

For phosphorus the Vaughan procedure is unsatisfactory, due among other things to the fact that losses are incurred by spitting of the solution being evaporated. In batch analysis of phosphorus it is quicker to titrate the phosphomolybdate precipitate with caustic alkali than to measure the absorption of the molybdenum blue formed on subsequent reduction.

The phosphomolybdylvanadate method of Harrison (1933), who determined phosphorus in cast iron, is sensitive to interferences in solution and to temperature effects. Again, it is less sensitive than the molybdenum blue procedure.

## —COATING OF TABLETS.

TABLETS are generally given a coating of a particular kind for a number of reasons. Tablets containing such unpleasant drugs as quinine or cascara sacrada are more palatable when sugar-coated, therefore sugar coating is applied to this type of tablets for this reason. Another purpose of coating is to improve the appearance of a mottled tablet: the mottled unavoidable and due to ingredients in the recipe. Some tablets are liable to deteriorate in stock through absorbing moisture. Deterioration can also take place through chemical reaction due to absorption of moisture. In this case a sugar coating will act as a protective shell. Many tablets have to withstand a tropical climate: sugar coating would not be serviceable under these conditions. therefore a gelatine coating is advisable.

### COATING EQUIPMENTS

In coating tablets the following plants and accessories are required:—

The number of coating pans necessary will depend on the output required. The usual suize of pan is 30 inches in diameter. A pan of this size will hold approximately 35 lbs. of 3 grain uncoated tablets. This batch when coating is finished should weigh approximately 70 lbs. Coating pans may be made of galvanised iron, copper or stainless steel.

In addition to coating pans, one polishing pan is also required. This pan may be made of galvanised iron. It is advisable to keep a separate polishing pan for white tablets if various coloured tablets are to be polished.

For sugar coating a syrup is used, and sufficient should be made up to coat the batch in hand. A container to held ten gallons of B. P. Syrup (i.e. 2 parts Sugar, 1 part Water) would suffice for the coating of the 70 lbs. of tablets in two pans, the approximate finished weight of the batch being 150 lbs. Stainless steel is the most suitable metal for the container as it does not corrode and it is easier to clean.

The most convenient way of applying the syrup coatings is by means of a stainless steel ladle holding about four fluid ounces. It is easy to manipulate and allows the solution to be distributed evenly over the tablets as they are rolling.

A glass stirring rod will also be required to keep coloured syrups intimately mixed before applying to the tablets.

A pair of dispensing scales kept handy will enable the coater to check the progress of his work. A few tablets weighed from each pan will reveal whether the respective pans are giving an equal performance.

A small container with a perforated top is also required for applying dusting powder to the tablets.

### METHODS OF HEATING

In coating tablets it is necessary to dry thoroughly each coating before giving a further application of coating solution. Heat is usually employed, and the method of heating can be by gas, electricity or steam. The heat is transmitted to the pans by hot air.

A fan blower provides the air current. The air is preheated and blown through the pipes directly into the pans. The pipes should be fitted with a fine mesh gauze near the fan, to prevent foreign matter entering. The hot air can be regulated by control slides which are fitted into the piping. With steam heating the coating pans can be heated direct by steam coils. The coils are arranged around the outside of the pan, keeping a constant supply of heat to the body of the pan which automatically dries the coatings as

they are applied. Steam heating is useful for quick drying of tablets which readily absorb moisture, but for general coating purposes a hot air blower is preferable.

After coating the tablets with syrup, dusting powder is sprayed over the tablets to prevent the tablets from sticking one another. In many cases the addition of dusting powder is continued upto approximately one-third of the total coating. This shortens coating time by giving a quick build-up to the tablet. A good dusting powder for this purpose can be made from:—

| | |
|---|---|
| Starch | 6 lbs. |
| Talc | 1 lb. |
| Powdered gum acacia | 2 oz. |

Mix and sift through a fine cloth.

### COATING PROCESS

Sugar coating is probably the simplest type of coating to process. After an initial batch has been coated and the difficulties discovered and remedied, a formula can be worked out for future batches.

To illustrate the coating process assume the following to be the formula selected (3-grain tablets to be coated to 6-gr.):—

| | | |
|---|---|---|
| Tablets | 35 lbs. | |
| Dusting powder | 4 ,, | (approx.) |

B. P. Syrup consisting of 25 lbs. Crystal sugar (approx.) and 12 lbs. water.

It should be noted that tablets for coating are usually more compressed with what are known as "sugar coating punches" (or s/c in short), these having a deeper concavity than standard concave punches.

To start operations, switch on the fan, also the heat. Set the pans revolving and the tablets will commence to roll. Now make the first application of syrup. A batch of 35 lbs. of tablets will take approximately 3 fl. ozs. to moisten. After the syrup-application (which should have been well distributed over the batch) sprinkle some of the Dusting Powder. A few ounces of Dusting Powder should be applied at the moment the tablets commence to fall away but are still "tacky." When applying the Dusting Powder shut off the air temporarily until the powder is absorbed, and then the vent can be opened again. Heat should be moderate, and the air supply likewise, until the tablets are dry. A full draught of warm air can then be applied to ensure the tablets being thoroughly dried before the next application of Syrup. The Syrup and Dusting Powder applications continue in this manner. A 35 lbs. batch of 3-grain tablets will require a total of about 4 lbs. of Dusting Powder. When this amount of Dusting Powder is applied the rest of the coating can be continued with warm Syrup alone. At this stage tablets will have an uneven appearance owing to the Dusting Powder having built up on the surface. The continuance of Syrup coatings will smooth the tablets cut providing they are applied gradually and the Syrup is not allowed to get too warm. A good tip for this smoothing out process is to apply the Syrup, shut off the air, and let the tablets roll as long as possible without air. They will roll in the pan in a syrupy mass and gradually fall away. When the tablets have separated, apply the air and finish off the drying. Occasionally bits will form in the pan. These are small grains of sugar which are gradually building up. The tablets should be taken out and sifted before the small pieces increase in quantity. If these small granules are allowed to roll in the pan, they will eventually adhere to the tablets and be covered over as the Syrup is applied. They will form unsightly bulges on the surface of the tablets.

The coating should be continued until the tablets weigh approximately 6 grains. At this stage they should be smooth and have a hard surface suitable for polishing. To guarantee a hard coated finish, run the pan on cold air and give the tablets one or two coatings of cold syrup. Allow the tablets to roll until dry—but not longer as a powdery will show up and this is detrimental to polishing.

It is advisable to spread the tablets on suitable trays overnight, and leave in a closed cupboard, polishing them the next day.

### POLISHING

The polishing can be carried out in the polishing pan which has been previously coated with a thin layer of Paraffin Wax. The polishing pan will fit on the same stand as the coating pan, or a pan complete with stand and motor can be carried out in about twenty minutes. It is only necessary to let the tablets roll in the pan and they will take on a thin film of wax through constant friction as the pan revolves. If a high polish is required a sprinkling of dissolved Bees-Wax in Ether will give the desired effect. Time taken for the total process will depend on the adaptability of the operator. Naturally, with experience he will improve his speed and technique.

The process outlined above is merely basic. In many cases experienced coaters use Dusting Powder almost to the end and then finish off with cold Syrup, but they have the skill and knowledge to control the process. They know how and when to apply the Dusting Powder, also the quantity to use. They also know when to apply heat and when not to do it.

There are certain tablets which must not come into contact with moisture owing to the nature of the ingredients. Any absorption of moisture from the Syrup in this case would be fatal, as the coating of varnish to the tablets first. Give the a thin protective shell and then the coat ing can proceed. A good varnish for th purpose can be made up from G Sandarac and Spirit. Tablets such Cascara Tablets should be given a go sub-coating to prevent dark patch appearing on the coating.

### COLOUR AND CHOCOLATE COATING

The basic formula for sugar coati applies to coloured coated tablets, a tablets which are chocolate coated. T only variance is that with the former Syrup is tinted with the desired col The latter has a proportion of Choco Powder mixed with the Dusting Pow which is used in combination with Syrup. The Syrup should be sui able coloured with Chocolate Br Paste. Coloured Syrups are best appl in the following manner: a light sh first, and subsequent applications o slightly darker tint, until the desired sh is reached. By this method an even re will be obtained.

### GELATINE SUB-COATING

Hygroscopic ingredients can cau endless trouble if the initial stage of co ing is not thoroughly carried out. A g sub-coating with Gelatine Solution a Dusting Powder will suffice to counte any troubles from this source.

The Gelatine Solution can be mad from one part Gelatine, 12 parts Sugar, parts Water. This mixture should warmed and stirred until thoroughly di solved. Use sufficient to moisten sligh and continue to apply until a t protective shell is formed around th tablet. Always apply warm as there w be tendency to gelatinise if the soluti allowed to cool. If this solution does h pen to gelatinise through being lef standing, it will revert to solution ag on re-heating.

## —Substitution of Coconut Oil in Soap.

in the manufacture of high grade soaps and it usually forms 25-30 per cent of the otal fat used. The soap is easily soluble n water, giving profuse lather and possesing excellent washing and detergent roperties. As there is a shortage of dible fats in this country at present, there s an imperative need for substituting oconut oil by other fatty materials in the oap and hair oil industries.

It is for this purpose Messrs S. C. Gupta; J. S. Phadnis and J. S. Aggarwal f the National Chemical Laboratory, Poona, have investigated to find out the est substitute of coconut oil and published he following article in the *Journal of Scientific and Industrial Research* for the enefit of the soap-makers.

The excellent properties of coconut oil oap are mainly due to the presence of uric and myristic acids as major components of the total fatty acids of coconut oil. The effect of alkyl chain length on the pro rties of soap such as Herbig number, me of sinking and drop number has been vestigated by Shirolkar and Venkataraman. Of the various saturated fatty acid oaps, sodium and potassium myristates as been found to possess the maximum etting action, foaming and detergent proerties at ordinary temperatures. As edible oils with myristic acid as a major omponent are not available in sufficient mounts in India, attention has been irected in the investigation of lauric acidich oils. Seeds of Actinodaphne hookeri Actinodaphne angustifolia, cinnamomum amphora, Laurus nobilis, Litsea chinensis, Litsea Setafera, Litsea citrata, and Litsea eylanica are available in Indian forests and their fats have been found by Puntambekar; Puntambekar and Krishan; and Collins to contain 43 to 96 per cent lauric acid. In the present investigation the seed fat of Actinodaphne hookeri locally known as Pisa fat, is used in place of coconut oil in soap. Its fatty acid consists of 96 per cent lauric acid. Castor oil and groundnut oil mixtures along with Pisa fat have also been tried.

Hydrogenated rosin is a valuable ingredient of soap preparations. Its sodium derivative has been recommended as a substitute for coconut oil in soap. The sodium salt of rosin was used in admixture with other sodium soaps to ascertain whether it can replace coconut oil in soap manufacture. Lather value, hardness, wetting and detergent tests were carried out on each sample of soap. Soaps thus prepared were found to be comparable to the usual tallow-coconut oil soaps in many applications.

### EXPERIMENTAL

In order to obtain alkali-free neutral soaps the oils and fats used in this investigation were first hydrolysed to fatty acids and neutralised by the addition of requisite amounts of a strong solution of caustic soda. The reaction was completed by heating on a water bath for 1 hour. The sodium soap so formed was dried in the sun to a moisture content of about 10 per cent. Hydrogenated rosin was similarly treated. The soap was then milled in a three-roll mill and the moisture content was finally adjusted to 10-12 per cent as determined by the xylol method. Forty grams. of this material was moulded to a cylindrical cake of 1¼" diameter by pressing for 5 minutes under a pressure of about 250 lbs per sq. inch at a temperature of 40°C-50°C. The cakes were aged for a week in closed glass vessels. The following determinations were made:—

1. Lather Value.—The lather value was determined by shaking 50 c.c. of 0.2

per cent soap solution in one litre stoppered graduated cylinder for 30 sec. and noting the volume of the lather produced after 5 minutes. The stability of the lather was found out by noting the volume again after 24 hours. The values were determined at room temperature (25° to 30°C.).

2. WETTING TEST. — The concentration of soap required for causing the sinking of a 5 grms. of skein of grey cotton yarn in 25 c.c. at 40° was determined by Drave's method.

3. HARDNESS. — The comparative hardness of different samples of soap was determined by determining the weight (in pound) required to pierce through and break the cake. A bronze, hemisphere, 2 cm. diameter was employed for this purpose. A cement testing machine was suitably modified for carrying out this test.

4. DETERGENCY TEST — A piece long cloth was first boiled in sodium ca bonate solution, thoroughly washed w water and dried. It was soiled in petrole to which carbon black (1 per cent.) a groundnut oil (2 per cent) were add The cloth was dried in the sun by sprea ing horizontally on a frame. Test-piec 5" × 5" having an even shade was chos The test piece was shaken in 100 c.c 0.3 per cent soap solution, for half an h with distilled water. The test piece then dried in shade and the extent o removed was examined visually. T above test was done in duplicate with sample of the soap. The compositi various soap samples together with th lather value, wetting test value and har ness are given in the following Table. T detergent qualities of all the samples found to be almost identical.

**COMPOSITION AND PROPERTIES OF VARIOUS SAMPLES OF SOAP**

| Acid Composition of Soap. | Lather Value 5 min c. c. | Lather Value 24 hr. c. c. | Drave's Wetting test values (Soap concentration required for 25 Sec. wetting time), Gm/litre. | Hardness lb. |
|---|---|---|---|---|
| 1. Tallow 75 p. c. + coconut oil 25 p. c. | 230 | 195 | 0.56 | 5[illegible] |
| 2. Tallow 75 p. c. + pisa fat 25 p. c. | 250 | 210 | 0.72 | 6[illegible] |
| 3. Tallow 75 p. c. + pisa fat 15 p. c. + stearic acid 10 p. c. | 200 | 160 | 0.88 | 6[illegible] |
| 4. Tallow 65 p. c. + pisa fat 25 p. c. + castor oil 10 p. c. | 300 | 265 | 0.55 | 5[illegible] |
| 5. Tallow 65 p. c. + pisa fat 25 p. c. + groundnut oil 10 p. c. | 280 | 230 | 0.57 | 6[illegible] |
| 6. Tallow 60 p. c. + castor oil 20 p. c. + groundnut oil 20 p. c. | 280 | 240 | 0.49 | [illegible] |
| 7. Tallow 75 p. c. + rosin 25 p. c. | 210 | 170 | 0.56 | 8[illegible] |
| 8. Tallow 75 p. c. + hyd. rosin 25 p. c. | 240 | 200 | 0.67 | 91[illegible] |
| 9. Tallow 65 p. c. + Pisa fat 25 p. c. + Rosin 10 p. c. | 240 | 200 | 0.52 | 61[illegible] |
| 10. Tallow 65 p. c. + pisa fat 25 p. c. + hyd. rosin 10 p. c. | 280 | 240 | 0.56 | 76[illegible] |
| 11. Tallow 60 p. c. + groundnut oil 15 p. c. +hyd. Rosin 25 p. c. | 270 | 200 | 0.56 | 6[illegible] |
| 12. Hyd groundnut oil 75 p. c. + pisa fat 25 p. c. | 290 | Thinned | 0.57 | 5[illegible] |

**DISCUSSION**

From the data given in the above table it will be seen that substitution of lauric acid rich in Pisa fat for coconut oil has increased the lather value in samples 2, 4 and 5. Less lather has been obtained in sample 3 due to the partial substitution of a longer chain stearic acid in place of Pisa fat. Again, substitution of 10 per cent Castor oil and groundnut oil in samples 4 and 5 for the same amount of tallow (sample 2) has resulted in a marked increase in the lather value. Drave's wetting test values for these two soaps have also been quite low and are quite close to that of coconut oil soap. They were also found to be less hard than others because castor and ground oils are known to give softer soaps than oils containing predominantly saturated acids. The effect of the soap from these two oils is very clearly indicated by the results of the values of sample 6 containing tallow 60 per cent, castor oil 20 per cent and groundnut oil 20 per cent. This soap has given lather value higher and wetting test value lower than coconut oil soap (Sample I) although the hardness has been slightly lower than the latter.

Hydrogenated rosin soap has given a quite good lather value (samples 8 and 10) and has proved better in comparison with ordinary rosin soap (samples 7 and 9). It also retards spotting in soap on storage which usually takes place when ordinary rosin is used. But a combination of lauric acid soap along with that by hydrogenated rosin has definite advantages. Substitution of Pisa fat (lauric acid) by groundnut oil and hydrogenated rosin (sample II), however, lessens the stability of the lather of the soap.

An attempt was also made to substitute tallow by hydrogenated groundnut oil (I. V. 20-22). Although a good amount of lather was obtained, it was very thin and subsided within 24 hours This may be due to the conversion of oleic acid mostly to stearic acid and partly to iso-oleic acid during hydrogenation. The soaps of these two acids have less solubility and wetting action at low temperature (25°-30 C). Other soaps (Nos. 2 to 10) have given lathers of nearly equal stability and are almost identical to coconut oil soap.

The hardness of all the samples of soaps with the exception of No. 6 have been found to more than that of coconut oil soap (No. 1). This may be due to the presence of 15-20 per cent copric and other lower acids present in coconut oil. The existence of these acids in coconut oil is definitely a disadvantage because their sodium salts have very poor lather values and wetting action. However, they are very soluble in water and are removed during the salting out stage. But these acids have not been removed in the present work and were allowed to form a part of the soap.' The differences in hardness may not be regarded as a great drawback because by proper formulation of the oils and fats, it may be adjusted to the desired limit. Samples 4, 5, 6 and 10 are quite satisfactory as substitutes for standard coconut oil soap.

**CONCLUSION**

From the above experiments it may be concluded that coconut oil can be substituted in soaps by suitable mixtures of lauric acid-rich fats, castor oil, groundnut oil and hydrogenated rosin.

# NECESSITY OF ELECTRICITY FOR THE DEVELOPMENT OF METALLIFEROUS MINES IN INDIA.

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METALS form one of the earth's most important resources in the support and enrichment of human life. With the progress of civilisation consumption of metals has steadily increased in all free countries. Hence in Free India the need for more metals should naturally be realised in view of rising living standards as well as increasing population. Everywhere there should be a sustained drive to bring into use mineral resources as yet untapped, to build up with the revenues obtained from this source more productive and diversified economies.

For the necessary development of metalliferous mines in India cheap electrical energy is of fundamental importance specially in those areas where coal is not locally available. For example it may be noted that in Mysore State the Kolar Gold Field could be developed to great depths of about 10,000 feet by the utilisation of the hydro-electric power of the Cauvery Falls since 1903. Annual consumption of power in Kolar Gold Mines has now exceeded 100,000,000 K. W. Hours. Some time back for the Lead-Zinc-Silver Mines of Burma Corporation Ltd. Hydro-electric power was obtained from the neighbouring Mansam Falls where several turbines were installed with an aggregate capacity of more than 10,00 K.W. For the development of Rand Gold Mines in South Africa as early as 1906 the most important power supply system originated with the idea of developing the water-power of the Victoria Falls. The present capacity of the power stations for Rand Mines is more than 200,000 K. V. A. which was the figure when I visited that country nearly a decade ago. The hydro-electric development also progressed in Canada.

As compared to the figures stated above the aggregate horse power of electrical plant used in the coal mines in India increased from 122, 833 in 1945 to 131,801 in 1946, and in metalliferous mines the respective figures were only 8,568 in 1945 and 10,43q in 1946 as published in the Annual Reports of the Chief Inspector of Mines in India excluding the States.

Since the separation of Burma it has become necessary to develop the Lead-Zinc-Silver Deposits in India, for which I have personally examined the workings for proving such deposits in Rajasthan State. As a result of intensive investigation during the last war valuable deposits have been located at a place known as Zawar about 29 miles from Udaipur. There in Mochia Magra Hill it was estimated recently to have more than 1,37,000 tons of ore containing at least 20% Lead and 7% Zinc with some Silver. Besides this hill there are at least thirty other hills in the same area where ancients had extensively worked for such values. Coal and other fuels are not available locally and not far from this area I have seen excellent sites for large reservoirs of water which in my opinion can be harnessed for irrigation of the land and generating necessary power economically for the rapid development of these and other valuable

metalliferous deposits for the amelioration of the condition of the people as well as for their protection.

Incidentally these large reservoirs of water in this State will change the face of the Earth to the satisfaction of all and revive the past glories though one may not easily believe such a possibility at the present time when the hills in this area appear to be so barren and are so close to the famous deserts of Rajputana. But when one finds more than million tons of slag heaps in an area which is far away from coalfields one naturally concludes that the ancients must have consumed the local timbers for the mining and smelting of these ores. Without foresight the consumption of timber might have been so ruthlessly carried out in those early times when the land was in the height of its glory that the area became deforested and the climate was so affected thereby that the region appears be arid at present. So I hope the land will be smiling again in the near future by the successful planning and development by modern scientific methods along with the destiny of Free India.

I received the inspiration for this paper while I was reading the paper entitled "Metals in Relation to Living Standards" by Dr. D. N. Wadia, Director, Bureau of Mines, Government of India, and have quoted the very first sentence thereform.

To support my concluding remarks as stated above I quote the following in detail from the book entitled "Man and Metals" by T. A. Rickard. Page 779. "In process of time the demand for fuel caused the destruction of the woodlands to such an extent that many regions became deforested, and the climate was changed thereby. For example, the smelting of silver-lead ore at the mines of Laurium contributed to the denudation of Attica. Plato, in the Critias dialogue, tells us that in the old days there was an abundance of forest on the mountains. "Of this last", he says, 'the traces still remain, for there are some of the mountains which now only afford sustenance, to bees, whereas not long ago there were still remaining roofs cut from the trees growing there, which were of a size sufficient to cover the largest houses: and there were many other high trees, bearing fruit, and abundance of food for cattle. Moreover the land enjoyed rain from heaven year by year, not, as now, losing the water which flows off the earth into the sea, but, having an abundance in all places, and receiving and treasuring up in the close clay soil the water which drained from the heights, and letting this off into the hollows, providing everywhere abundant streams of fountains and rivers; and this proves the truth of what I am saying. "Attica, once well clothed with leafy verdure, has become an arid region. Cyprus has suffered likewise; once reputed the most fruitful island in the Mediterranean, it was stripped of its woods when it fell into the hands of the Turks, the consequences being a diminution of rainfull, the drying of watercourses, the formation of swamps on the seashore, and the prevalence of a deadly form of malaria. Other examples might be cited. The tumbled hills of the Sierra Morena, in southern Spain, where once great forests stood, are today bare, in mute testimony to the destructive activity of the miner, successively Iberian, Carthaginian, and Roman, who despoiled the woods for the charcoal needed to smelt the silver, lead, and copper ores of this rich mineral region. The modern mining districts of Colorado and Montana, all of which were started amid pine forests, are today bleak and bare, only the stumps of trees remaining to remind the newcomer of the days when the prospector found shelter under the spreading boughs. The effects of deforestation have been studied scientifically; it has been ascertained that the forest is a regulator of climate, because it decreases extremes of temperature in the

vicinity; the forest is cooler and more humid than the level country, it stores the snow and rain, retarding the melting of the one and conserving the other in its leafy soil, thereby enabling the accumulation of water to feed the springs that flow gently into the plain when required for cultivation. The coolness and moisture of the forest promote the condensation of the lower layer of clouds; the differences of temperature between forest and plain cause a healthful circulation of the air, the woods serve to check the destructive effect of violent winds. Deforestation therefore diminishes the rainfall, increasees the evaporation, causes extremes of temperature, and facilitates the destructive action of torrents, avalanches, and landslips. Such disastrous effects have ensued in many regions on account of the consumption of wood as fuel on the hearth and as charcoal in metallurgic furnaces. During later days the lavish use of timber in mines has caused the hillsides to be denuded of their growth, as most of our western American mining district show.

A typical example of deforestation is to be seen on the eastern slope of Sierra Nevada, overlooking the Trucee Valley where the cutting of trees to provide timber for the deep mines of Comstock left the hillsides exposed to erosion so that today they are bleak, barren, and hideous. Most of the old mining regions tell the same tale, from Linares to Leadville, from Potosi to Porcupine".

In conclusion I may state that in India today we have a large number of metalliferous mines which are only at the initial stage of development. With the supply of electricity they will surely be in a position to step up their production of ores and completed the smelting thereof in order to cope with the steeply rising demands of metals for the amelioration of the condition of the people in Free India and their protection.

## —ENAMELLING GOLD AND SILVER

THE idea of enamelling (in the jeweller's sense and not as understood by the painter or cycle maker whose enamel is something different) is said to have arisen from observation of the effect when early metalworkers, spilling hot metal on sand (which is silica and one of the constituents of glass), noticed how the amalgamated mass exhibited colour. In course of time the colours arising from one metal and another composed quite a new range.

When in a molten state, glass absorbs particles from metals with which it may happen to be in contact, and by them it becomes coloured. Cobalt, for instance, gives glass a fine blue colour, chromium imparts a green. There, in few words is the clue to that delightful art of enamelling which gives us one of the most charming results in the whole of jewellery technique.

Here are some colours and the minerals responsible for enamelling gold and silver articles:

Ruby red—.01 per cent gold chloride.
Yellow—.015 per cent uranate of soda.
Aquamarine—3 per cent bichromate of potash.

Emerald— 10 per cent nitrate of copper.

Bottle Green—10 per cent oxide of iron.

Blue—2 per cent black oxide of cobalt.

Purple—15 per cent permanganate of potash.

All these make clear transparent enamels; and if opaque enamel is wanted various oxides, like oxide of tin, are used to make a basic whitish composition, which can then be tinted like the transparent kind. The glass used, in crushed form, is flint, which has 25 to 40 per cent of lead oxide in it and is to that degree more fusible and more refractive (i.e., more sparkle). The metallic constituent is likewise crushed in a mortar to powder and mixed with the powdered glass. It is laid into place on the silver surface of the object to be enamelled, the whole is placed in an oven, in the heat of which the powdered layer fuses into a glass-like covering. It will not be perfectly smooth, but is gone over with carborundum stone and water, after which two further coats of enamel may follow. To get final smoothness, the article is held against the revolving felt mop of a polishing spindle charged with pumice.

The final coat of clear transparent enamel used on high grade work makes for a longer life, and consists of best transparent glass enamel ground up and melted in the furnace.

Now to answer the question of the young lady as to whether enamelled goods were washable; the answer is: Yes. Naturally one would not drop an enamelled vanity or toilet mirror into hot water, but the limits of treatment enamel will stand are such as could be expected from an article coated, you now realise, with a thin film of glass. As such it cannot be harmed by a gentle wiping.

Enamelled cigarette cases, vanities, brooches and wherever touches of enamel are incorporated in jewellery, as on ear-rings, rings, necklace beads, pendants, etc., all are coloured in this way; in the case of the larger articles the silver ground has often been given added interest by an engine-turned decorative surface, which sparkles through the enamel and gives a pretty effect that few ladies can resist.

The porcess named is a modification of (1) the basse-taille (Fr., low, to cut)

system, one of the five traditional methods of enamelling; in this the surface is recessed to receive the enamel. Of the remaining processes, the second and the third have a slightly different method of creating these recesses (not necessarily deep) to keep the flowing enamel under control; in (2) you can have wire soldered down on to the surface so as to determine limits to which the enamel must keep. This is rather on the stained-glass window principle in which lines of lead define the main drawing of the subject, and each department contains one colour, as it does also on the enamelled object. Based on the French word for divisions (cloisons), this is called Cloisonne Enamel. In it the gold or silver dividing wire will always be clearly visible.

(3) The third system arrives at the compartments by a different way. The silver being fairly thick in the first place, you gouge out the required recesses with a graving tool, leaving a line of the original silver standing between each division. In effect, you "draw" by leaving untouched the original surface, just as a wood engraver cuts his printing block. This is called the Champleve (Fr., ground removed) process.

(4) In the fourth method a dainty but most fragile stained glass effect in miniature is secured by having no support at all for the enamel and letting it be seen by transmitted light. This sounds almost impossible, until you learn that the enamel was, in the first place, laid on a temporary ground, the different colours separated as before by wires. Afterwards, under the influence of heat, the enamel springs off the ground and so becomes separated from it. In another method the retaining wires are bedded slightly into plaster and the enamel laid in the various compartments so formed, the whole being then fired.

(5) When the fashion is inspired that way, you will find the young ladies in the enamelling workshop painting birds and beasts, also flowers and, in fact, any pictorial subject from Windsor Castle to a Titian-haired beauty walking by the sea shore. If their skill can cope with subjects like this they ought to be called artists, and what they are doing follows the fifth enamelling process, the Limoges or Painted Enamel tradition.

Ground enamel is laid down, following in colour the pictorial design, but taking care that the colours do not mingle. After fusing by heat and stoning smooth it may be that further colours need superimposing on those already there, as for example, a second colour pattern on dress. In this case it is a matter of going carefully to work so that later fusings of colour do not spoil the colour already set.

Enamelling is done on gold as well as on silver, and the effect of the gold under tone, as on brooches, lockets, etc., is worth observing as giving more mellowness to the enamel. Gold intended for enamelling has a large proportion of silver in it making a paler metal. But, as showing what a critical operation enamelling can be, the presence of more silver so lowers the melting point of the gold that when the article is in the furnace care has to be used not to melt the gold itself whilst fusing the enamels.

# —Printing Artificial Silk with Phosphorescent Effect.

CERTAIN amount of progress has ecently been made in obtaining phorescent or faintly luminous effects designs on artificial silk fabrics. the printed articles so far produced, phosphorescence results principally gh the use of colours and products h absorb the rays of light during the or through artificial light, and trans- hem in the dark or in reduced light. slightly luminous designs have a ent glow in accordance with the rs used and show up better in pale red patterns, yellows, oranges, blues greens, than in reds, greys, black or dark colours. Besides this, they are rally more marked or visible on bright on dull grounds, and on white grounds r than on black or dark ones. her, with certain types of fabrics are clearer and more visible; success nding to some extent on the fabric g a flat smooth surface, and the lance of strong or pronounced chan- between the projecting portions of the ds, where the phosphorescence ld remain either partially or totally en. They can also be used for pro- g lustreless patterns on bright nds. In all cases the fabrics treated a special attraction of their own and patterns show up very prominently.

f before the application of the phos- escent material a base of white or r could be applied this has the pro- of intensifying the effect of the nous colour by reason of the rduced tration into the fabric, and also to a n extent smoothing out the surface of lecoration.

The phosphorescence produced in the ed effects can be white, and can issue from white or otherwise coloured lustreless designs or parts of designs on white lus- treless rayon cloth. If it is in bright canary yellow it can be brought out from less bright yellow or red patterns; if bright greenish yellow from yellow patterns; if yellowish green from blue or grey patterns; if orange yellow from yellow patterns; if orange red from orange patterns; if neutral orange from medium orange or yellow patterns; if green from medium brown, slightly green- ish grey and violet patterns; if blue from very light brown patterns, if violet from very light brown and light pea green patterns. A large number of varieties between the colour of pattern from which it is developed can be made very pronounc- ed by adding aluminium bronze and zapon colours to the phosphorescent zinc sulphur colours.

Although progress has been made in the production of the above phosphores- cent effects and designs on rayon cloth so that articles can now be launched on the market, the still undeveloped technique, the limitations of processing, and the few products at present at the disposal, restrict the field of exploitation. The number of applications, however, are quite sufficient to permit enterprising opening manufactur- ers who are in search of opening to work with every chance of success. There is little doubt that when scientists and technicians have given the matter greater attention and study, many improvements will be made, thus increasing the value, number and variety of goods produced, and in certain cases achieving permanent or persistent luminous patterns.

**APPLICATION OF PHOSPHORESCENT PRINTED GOODS**

Properly prepared phosphorescent

effects and designs on artificial silk fabrics not only permit the manufacture of women's and girls' clothing in an entirely new fashion, but they are also of special interest for other purposes. Rayon viscose cloth, having prints with a sufficient degree of phosphorescence can certainly be used with advantage for evening wear, in social gatherings, in festivities, etc.

Further attractions may be obtained by the printer supplying fabrics having phosphorescent designs of different nature across the width, which produce stripes that can be easily cut out of the pieces whenever required for making frocks. In other cases, articles having regular phosphorescent patterns running down the whole of the rayon viscose pieces may be required. These are specially applicable for the manufacture of loose-hanging frocks used without waisted effects or with a few folds as possible, as with this arrangement the luminous appearance of the pattern can be shown to its greatest advantage. Amongst the other applications of phosphorescent effects and designs there is the production of special varieties of curtain fabrics, furnishings, handkerchiefs, etc. It is easy to imagine, for instance, the advantage of curtains which show luminous designs during partial or complete darkness.

**PRINTING PASTES**

The printer has not yet at his disposal proper means for producing designs with very fine or delicate luminous details as the processes so far introduced render the production of these designs difficult or uneconomical. Designs without fine detail work can be obtained however, which are both attractive and interesting.

A three-colour article yields on bright viscose rayon material patterns of very satisfactory appearance and high phosphorescent properties, when exposed conveniently to light, is obtained with the following three phosphorescence producing pastes which also furnish an interesting scarlet red, blue, and yellow pattern when the respective yellow, yellow green and orange phosphorescences are not developed.

**SCARLET RED**

| | | |
|---|---|---|
| Fast zapon scarlet C.G. | 0.5 | parts |
| Nitro-cellulose varnish | 649.5 | „ |
| Zinc sulphide (luminous) | 250 | „ |
| Tricresyl phosphate | 100 | „ |

First dissolve the scarlet in the nitro-cellulose varnish (called kasara varnish) and then incorporate the other ingredients in the order given.

**BLUE**

| | | |
|---|---|---|
| Fast zapon blue C.G. | 1.5 | parts |
| Nitro-cellulose varnish | 648.5 | „ |
| Zinc sulphide (luminous) | 250 | „ |
| Tricresyl phosphate | 400 | „ |

Mix as before.

**YELLOW**

| | | |
|---|---|---|
| Fast zapon yellow C.G. | 4 | parts |
| Nitro-cellulose varnish | 649 | „ |
| Zinc sulphide (luminous) | 250 | „ |
| Tricresyl phosphate | 100 | „ |

The above phosphorescent colours are to be printed in the same way as bright varnishes; that is, the printing pastes are applied to the cloth, across the perforations of stencil plates, by the use of wooden knives. The stencil plates should have a thickness from 0.2 to 0.3 millimeters. The printing colours are in this case very dense so that they can not travel along or through the cloth. They remain therefore only superficially acid over the front. They can be diluted when necessary with butyl acetate.

The application of the printing pastes across the stencil plate must be conducted slowly to avoid the formation of air bub-

Besides this it is advisable to leave stencil plates on the material from : to five seconds after the application ie printing colours. Designs are form- ı this way, and the effects show up distinctly. The printed patterns, ›red as above, generally dry suffi- 'y after a few minutes. For complete ıg the cloths require to be hung for a e night or day.

he phosphorescent colours must not round more finely than the form in h they are supplied by the producers, he best phosphorescence depends having granules of a certain size. · some time, the phosphorescence in lark is slowly reduced, gradually ng altogether from half an hour to ur. After a short exposer to day light, artificial light of sufficient strength. hosphorescence returns to its full gth. It is necessary therefore to re- ite the design from time to time with of light.

**ROGRESS IN THE PRODUCTION OF PHOSPHORESCENT COLOURS**

'ertain progress has been made in the ıction of phosphorescent colours. the light producing effect is some- due to the presence of mixtures of parts of pure calcined zinc sulphide 1 part of copper sulphide. The cop- s generally added in the form of :r sulphate to a solution of sulphate ıc of convenient serength and sub- l to the action of sulphuretted hy- n. The mixture of zinc and copper ide obtained in this way is calcined for some hours at 1000°C. The resulting very fine white crystalline powder is dotted with good photo-luminiscence. The sensibility of sulphide of zinc to radio active rays is particularly important and it has been proved that light development phosphorescent colours is nearly exclusively existed by these rays. Regarding phosphorescence, the reduced purity of the sulphide of zinc is not of decisive importance, as products of satisfactory activity can be obtained with sulphide of zinc relatively rich in heavy metals besides copper. Of course, the percentage of these metals must not exceed a certain limit otherwise phosphorescence is no longer obtained. sometimes the activation of zinc sulphide is conducted by impregnating in a solution of radio active substances and drying at 100° C.

One may also obtain a sulphide of zinc that is tribo-luminescent, i.e., becomes luminous through pressure, by impregnating 20 parts of the products with 15 parts of a 4 per cent solution of manganese drying and calcining for two hours at 900 C. There are also phosphorescent colours prepared with boric acid. Phosphorescent colours can be rendered luminous through addition of radio active substances. Generally these colours are incorporated in a fixing or binding agent. Those with sulphide of zinc can be fixed through a solution of gum arabic, although this reduces the phosphorescence power. Gum arabic is therefore seldom used. Phosphorescent printing inks are produced by using linseed oil as fixing medium.

DENTISTS and dental laboratories use quantities of various wax compounds as: base-plate wax, inlay-casting wax, impression wax compound, set-up-wax, bite wax, sticky wax and carving wax. In the hands of the dentist and of the technician, the dental waxes have to work and serve as ideal plastic materials. They must have high plasticity at normal temperatures, tensile strength, fusibility, hardness, adhesiveness and non-crystallinity. For instance, the requirements for base-plate wax include plasticity, fusibility, hardness, and light colour. Inlay-casting wax must soften without becoming flaky. It must not show appreciable chipping or flaking when trimmed to a fine margin, at room temperature. It should become very plastic when heated and harden very quickly when cooled. The melted wax, when vaporized at 500°C., must have no solid residue other than carbon. It must have a certain thermal expansion and flow.

Carving wax should be hard, of very fine grain, and easy to carve. Sticky wax must have good adhesion but should not stick to fingers.

The following formulas are representative of these compounds:—

BASE-PLATE WAX

I

| | | |
|---|---|---|
| Paraffin Wax | 70 | parts. |
| Beeswax | 20 | ,, |
| Carnauba Wax** | 4 | ,, |
| Gum Dammer | 6 | ,, |

II

| | | |
|---|---|---|
| Paraffin Wax | 80 | parts. |
| Acrawax C | 5 | ,, |
| Rosin | 5 | ,, |

INLAY WAX

| | | |
|---|---|---|
| Paraffin Wax | 18.0 | parts. |
| Carnauba Wax ** | 3.5 | ,, |
| Resin * | 2.5 | p[illegible] |
| Candelilla Wax | 1.0 | |

STICKY WAX

| | | |
|---|---|---|
| Flexowax C | 11 | [illegible] |
| Beeswax | 11 | |
| Ozokerite | 13 | |
| Venice Turpentine | 2 | |

CARVING WAX

| | | |
|---|---|---|
| Paraffin Wax | 30 | [illegible] |
| Ozokerite | 30 | |
| Montan Wax | 20 | |
| Carnauba Wax ** | 20 | |

* The resin may be a phenol [illegible] resin or a petroleum resin.

** Carnauba wax can be repl[illegible] the synthetic wax Acrawax C.

In all these formulas the resin[illegible] waxes are being replaced more and by synthetic products, because the s[illegible] tic materials are free from imp[illegible] well-defined, and often cheaper th[illegible] natural products.

**METHOD OF PRODUCING BASE-PLA[illegible] WAX**

The resin, which must be very [illegible] is melted; then the waxes are add[illegible] heated till homogeneous. The hot are filtered through a fabric and heated. An oil-soluble dyestuff, pr[illegible] ly dissolved in a part of the paraffi[illegible] is added, for coloration and the [illegible] stirred till completely uniform, [illegible] again, and poured in flat pans. A[illegible] few days, the cakes are heated in [illegible] water and milled on a two-roll m[illegible] rolls having the same speed and [illegible] made of granite or stainless steel. [illegible] cooling in cold water, the milled sh[illegible] wax are stamped.

## EASTON'S SYRUP

| | | |
|---|---|---|
| Iron | 8.6 | grms. |
| Phosphoric acid | 40 | c. c. |
| Strychnine hydrochloride | 0.3 | grms. |
| Quinine sulphate | 14.8 | .. |
| Simple syrup | 560 | c. c. |
| Glycerin | 140 | ,, |
| Distilled water to produce | 1000 | ,, |

Dilute the phosphoric acid with 80 c.c. of of distilled water; add it to the iron contained in a flask of suitable size, and heat on a water-bath, until the iron is dissolved. Add the solution to the strychnine hydrochloride and the quinine sulphate previously triturated with 9 c.c. of distilled water. When solution is complete make up to 250 c.c. with distilled water, filter it into the syrup and glycerine, previously mixed and pass sufficient distilled water, through the filter to produce the required volume.

## SYRUP FERRI IODIDE

| | | |
|---|---|---|
| Iron, wire, cut into small pieces | 12.5 | grms. |
| Iodine | 41.5 | .. |
| Diluted hypophosphorous acid | 20.0 | c. c. |
| Sugar | 575.0 | grms. |
| Distilled water | q. s. | |

Introduce the iron and iodine into a flask of thin glass and add to it 150 c.c. of distilled water. Shake the mixture occasionally, checking the reaction by placing the flask in cold water, and when the solution has acquired a greenish colour and has lost the odour of iodine, heat it to boiling; and add at once 50 grams. of the sugar. When this has dissolved, filter the solution into the remainder of the sugar contained in a porcelain dish. Rinse the flask and iron wire with 125 c.c. of distilled water and pass the washings through the filter into the sugar. Stir the mixture with a glass rod, heating the liquid on a water bath until complete solution is effected and having passed the syrup through a clean muslin strainer into a tared bottle, add the diluted hypophosphorous acid and sufficient distiled water to make the product weigh 100 grams.

## CORN SALVE

| | | |
|---|---|---|
| Salicylic acid | 6 | dr |
| Methyl salicylate | 2 | .. |
| Wool fat | 2 | .. |
| Yellow wax | 2 | .. |
| Lard (benzoated) | 11 | .. |

Mix all the ingredients thoroughly in a mortar.

## ULCER OINTMENT

| | | |
|---|---|---|
| Oil of eucalyptus | 14 | parts. |
| Colophony | 20 | .. |
| Soft paraffin | 55 | .. |
| Hard paraffin | 11 | . |

Green colouring matter—trace.

Mix thoroughly in a procelain mortar and put in printed tin boxes. This preparation will not only be efficacious to ulcers but also to all skin diseases, cuts, bruises, eczema, etc.

## BRAHMI OIL

In preparing this medicated oil, sesame oil is generally used. This oil, before being boiled with medicinal substances is first of all heated to deprive it of any water by evaporating. It is then purified by steeping in it the following substances for 24 hours viz., madder 1, 16 part in weight of oil, turmeric, wood of symplocos recemosa, tubers of cyperus rotundus, a bark called nalaka, the three myrobalans, root of pavonia adorata and the tender shoots of pandanus odnatissium, each one sixty fourth part in weight of the oil. These ingredients in fine powder should be soaked in the oil, with the addition of an equal quantity of water for a day. The mixture should be boiled till the water is evaporated, and finally strained through clean cloth. To the oil thus prepared dried brahmi herb is added in the proportion of 4 parts of the herb to 16 parts of oil. The mixture is then boiled till the watery parts of all evaporated. This is then allowed to cool and strained.

## DIGESTIVE POWDER

| | | |
|---|---|---|
| Chebulic myrobalan | 1 | part. |
| Emblic myrobalan | 1 | .. |
| Ajwan | 1 | .. |
| Aniseed | 1 | .. |
| Ginger | 1 | .. |
| Rock salt | 1 | .. |
| Common salt | 1 | .. |

Mix in fine powder.
Dose: 1 to 2 teaspoonfuls after food.

## UNIVERSAL LINIMENT

| | |
|---|---|
| Oil sassafras | 1 dr. 10 drops. |
| Oil camphor | 2½ oz. |
| Oil of thyme | 3 dr. 20 drops. |
| Methyl salicylate | 100 mins. |
| Oil terebinth | 10 oz. |

Mix and add colouring matter, if required. This is a good pain relieving liniment.

## BISMUTHATED MAGNESIA

| | |
|---|---|
| Bismuth carbonate | 1 oz. |
| Sodium bicarbonate | 5 ,, |
| Magnesium carbonate heavy | 6 ,, |
| Simple syrup | a sufficiency. |

Mix to a slightly damp powder, pass through a 20 hole sieve, dry, and compress into 15 grains tablets.

### ICE CREAM POWDER

| | | |
|---|---|---|
| Powdered starch | 1 | oz. |
| Powdered sugar | 1 | „ |
| Orange dye, sufficiently to tint. | | |
| Essence of almond | 10 | mins. |
| Essence of vanilla | 10 | „ |

Mix. This quantity is sufficient for a pint milk, with which it is to be mixed, then ought to the boil, when cold put in the freezer.

### CRYSTALLISED COCONUT CHIPS

Prepare the coconut kernel by passing off brown skin. Cut them in thin slices and ck them in a crystallising tin. Now make aple syrup enough to cover them. Pour this n syrup over them while hot and stand aside 12 hours, then drain off the superfluous syrup removing the stopper from the tin. Spread chips on trays and put them in the drying om for 2 or 3 days turning them over at ervals. When dry put them again into the n; boil a like quantity of syrup as before and it stand till nearly cold; then pour it over chips and let remain undisturbed for other 12 hours; then strain again and spread em on trays when dry, they are ready for le. This, of course, will be white. To make e chips red simply colour the syrup which used for crystallising.

### COLOURING PHOTOGRAPHIC PRINT

Colour finishes of wide variety can easily applied to any photo without toning powders other chemicals. Take photographic or her transparent oil colour and thin it with rpentine to such a consistency that a wad of tton will readily absorb it. Be sure to use thing but turpentine for the thinner. Squeeze t the surplus colour and rub the cotton wad er the print, first lengthwise and then crosse, rubbing the colour into it until the surce is dry.

### ARTIFICIAL TEETH

The following is one of the processes adopt for the manufacture of artificial teeth. Pure artz is calcined by a moderate heat. When ken from the fire it is thrown into cold ater, which breaks it into pieces, which are en ground into fine powder. Next fluorspar, ee from all impurities, is ground up in like anner into a fine powder.

The next step is to mix together nearly ual parts, by weight of the powdered spar d quartz. This mixture is again ground to a eater fineness. Oxide of tin is now added to for the purpose of producing an appropriate lour and water and china clay to make it astic and give it consistency. This mixture sembles soft paste and is moulded into proper ape. After this, two small platina rivets are serted near the base of the tooth, for the purpose of fastening it to a plate in the mout They are now transferred to a furnace, whe they are "cured," as it is technically call that is, half-baked or hardened. The teeth a now ready to receive enamel consisting ground spar and quartz made into soft pas with water, which is evenly spread over th half-backed body of the tooth, by means of a delicate brush. The teeth must be next su jected to an intense heat. They are now p into ovens, lined with platina and heated by furnace, in which the necessary heat is obtai ed. When properly baked, they are remov from the oven and allowed to cool.

### PLAYING CARD VARNISH

| | | |
|---|---|---|
| Gum elemi | 56 | lbs. |
| Methylated spirit | 4 | gals. |

Dissolve. This is a colourless varni especially suitable for playing cards. You n not add any other ingredients; if you desire t make a pale varnish for your purpose th proceed as follows:—

| | | |
|---|---|---|
| Powdered pale manilla copal | 28 | lbs. |
| Powdered rosin | 56 | „ |
| Methylated spirit | 12 | gals. |

### BRILLIANTINE POMADE

| | | |
|---|---|---|
| Soft paraffin | 940 | parts |
| Beeswax | 60 | „ |
| Patchouli oil | 1 | part. |
| Vetivert oil | 1 | „ |
| Ethyl cinnamate | 1 | „ |
| Benzyl cinnamate | 1 | „ |
| Bergamot oil | 5 | parts. |
| Rose oil | 3 | „ |
| Balsam of peru | 4 | „ |
| Musk ketone | 4 | „ |

Melt the paraffin and beeswax over wat bath and add the other ingredients. Then p in wide mouthed bottles.

### ICED TEA

1. Prepare brew of hot tea in a teapot the usual way, using 3 ounces of tea to on gallon of boiling water. If possible use a teap with a removable infuser and withdraw afte 6 minutes, failing this, strain the brewed te into another pre-heated teapot.
2. Prepare a sugar syrup by dissolvin granulated sugar in boiling water using approx mately 2 pints to 1 lb. of sugar.
3. Fill a glass to the brim with small chipp ed ice.
4. Pour hot tea over the ice until glass is almost full.
5. Add sugar syrup.
6. Just prior to serving add a wedge of lemon and a prig of mint.
7. Serve with sundae spoon and straws.

**LECTRONIC INSTRUMENT TUNER**

An electronic apparatus to assist in the pid and accurate tuning of pianos and certain her musical instruments has been developed. gas discharge lamp is arranged to flash in accordance with sound reaching a microphone, and ght from this lamp is used to illuminate 12 tating discs. Each disc carries seven strotospic rings of black and white segments, arrang- so that each ring has twice as many seg nts as the preceding one. The twelve discs rrespond to each chromatic now in the seven taves marked on each disc., i.e.. there is a tal of 84 notes covered.

**EW FUMIGANT KILLS FRUIT FLIES WITHOUT DAMAGE TO COMMODITY**

U. S. Agricultural scientists have developed chemical that will kill destructive fruit and getable flies and still not damage the commody. The chemical is called ethylene dibromide d is used as a fumigant on perishable foods destroy the Oriental fruit fly, the melon fly, d the Mediterranean fruit fly. Fruits and getables sent from Hawaii to the United States ist be certified before shipment. Thus the mmodities have to be fumigated with chemi ls that will not damage perishable items. ientists working at the Hawaiian Agricultural periment Station in co-operation with research orkers in California found that fruits and getables are more tolerant to ethylene dibro de fumigation than to any other treatment sted. The chemical is applied to the commodties at the rate of 1 pound per 2,000 cubic feet space over a two hour period at 70 degrees threnheit. The treatment is for use on ocados, bell peppers, melons, bananas, cumbers, papayas, pine apples, string beans, d squashes.

**IBRATING TABLE.**

Containers of all shapes, sizes and materials n be effectively vibrated with the Kolt brating Table.

The table is of all-steel construction. The ble top is securely bolted to moulded rubber ountings which isolate it from the base. bration is not transmitted to the feet of the achine. An unbalanced weight rotated by a nall electric motor causes the vibration. This otor is secured to the table top by special untings to eliminate "contact rattle". The rface of the table is slightly dashed to prevent ntainers sliding off, and is covered with felt eliminate noise.

**OT AIR OVEN**

A new type of hot air oven, designed by ectricals, Ltd., has just been announced. ifficulty in the past has existed in obtaining very close temperature control but it is claimed that this oven, by reason of its design and construction, virtually eliminates this trouble.

Temperature range of the oven is up to 300°C. and it can be used for any temperature within these limits Internal measurements are 17 ins. cube.

A thermostat control gives the desired temperature at all parts of the oven to within 1½ per cent with shelves loaded, although the limits are finer than this for any one point. This very close temperature control is obtained by special features, the principles of these being a hot surrounding the interior of the oven, in which the air is circulated by a fan. An additional fan agitates the air in the oven interior. The heat insulation is such that the exterior of the oven remains cools at all times.

Due to the unique air bath principle used, it is possible to avoid switching the whole bank of heating elements on and off through the thermostat circuit, a system which invariably gives rise to great fluctuations in the oven itself. The small wattage controlled by the thermostat plus the extra elements controlled by a 5 position rotary switch when required to attain high temperature, provides very small temperature fluctuations.

A warning light to indicate failure of the fan, and a pilot light on the thermostat, are fitted on the control panel.

The oven is useful for all laboratory purposes and is ideal, by virtue of its temperature control, for the sterilization of syringes, etc. at 165 C

**OIL FOR EGG PRESERVATION**

A method of improving egg preservation by oil dipping designed to maintain the general quality of shell eggs is now being applied. Tests carried out with a special grade of oil supplied shell have shown that the treatment with oil of new laid eggs before cold storage maintains their taste and quality for as long as seven months. When an egg is thus treated the pores of the shell are filled with oil, loss of moisture and carbon dioxide is lessened and it becomes difficult for microbes to invade the interior.

—CHEMICAL AGE.

**PRESSURISED FIRE EXTINGUISHER**

A pressurised extinguisher designed to smother dangerous fires in metals has been developed by the Ansul Chemical Co. of Parinetti, Wisconsin. The extinguisher expels a dry powder known as met-X which forms a crust over the metal. It is claimed to be moisture-proof, non-toxic, non corrosive and non-abrasive. The device is reported to have been effective against fires in magnesium, sodium, potassium, zinc, and powdered aluminium.

—CHEMICAL AGE.

## —FORMULAS, PROCESSES & ANSWERS

### DHUP

786 H.H.S.C., Choharpur—Wishes to have formulas of dhup, tooth powder, etc.

In the manufacture of incense sticks, woods and spices are reduced to fine powder. The required amount of these powders are weighed out first and mixed. The mixture is then made into a thick paste with mucilage of gum acacia or gum tragacanth. The sticks are of bamboo splinters dipped in nitre solution and dried. These splinters are next vertically sunk into the fumigating paste taken in a wide-mouthed glass cylinder and withdrawn slowly. Observe that the coating is uniform. If not dip it again into the paste. Dry the stick vertically. Lastly pack.

Aguru 1 ch.; sandal dust 1 ch.; gugul 1 ch.; cassia leaves 1 tola, deodar wood 1 tola; jotamansi 1 tola; costus root ½ ch.; vetivert root 1 ch.; white dammar 2 ch.; nagarmoth 1 tola; sugarcane molasses 1 tola. Mix these ingredients together; add 4 pieces of lakhi and soak for 3 days. Then grind well into paste and make into incense sticks.

### TOOTH POWDER

| | | |
|---|---|---|
| Precipitated chalk | 35 | parts. |
| Magnesium carbonate | 25 | „ |
| Borax | 14½ | „ |
| Sodium bicarbonate | 14 | „ |
| Soap, powdered | 4 | „ |
| Sugar, powdered | 7½ | „ |
| Methyl salicylate | ¾ | part. |
| Menthol | 1/10 | „ |
| Cinnamon oil | 1/5 | „ |

Dissolve the menthol in the methyl salicylate, add the *cinnamon oil* and then add to borax and mix with sugar. Add to the other ingredients; mix and sift.

### IMITATION TABASHEER

553 P.H.M., Calcutta—Wishes to know a process of preparing imitation Tabasheer.

Tabasheer occurs at the nodes of bamboos and consists largely of hydrated silica. As Tabasheer is mainly a silica it may be prepared by decomposing silicon tetrachloride with water or an alkali silicate with acid. When concentrated hydrochloric acid is added to a solution of soluble glass, gelatinous silica separates. The mass is carefully evaporated and ignited, and the silica is thereby rendered insoluble by a process of polymerisation which accompanies dehydration. The residue is then digested with dilute hydrochloric acid to dissolve oxide of iron and other impurity, as well as sodium chloride, and finally washed with water, dried and ignited.

### TAILOR'S CHALK

638 K.N.B., Krishnagar—Wishes to have recipes of tailor's chalk.

WHITE

| | | |
|---|---|---|
| French chalk | 20 | parts. |
| Pipe clay | 20 | „ |
| White curd soap | 6 | „ |
| Water, to suit. | | |

Make into a stiff paste with sufficient water. From this form slabs of desired size and press into the oiled wooden or metal moulds. After moulding dry the pieces in a moderately heated place.

YELLOW

| | | |
|---|---|---|
| Chalk powder | 28 | parts. |
| Soapstone | 18 | „ |
| Pipe clay | 10 | „ |
| Yellow Ochre | 7 | „ |
| Lemon Chrome Yellow | 1½ | „ |
| Water, to suit. | | |

Proceed as above.

BLUE

| | | |
|---|---|---|
| Chalk | 20 | parts. |
| Pipe clay | 20 | „ |
| Soapstone | 15 | „ |
| Ultramarine blue | 10 | „ |
| Water, to suit. | | |

Proceed as above.

BLACK

| | | |
|---|---|---|
| Soapstone | 56 | parts. |
| Bone black | 8 | „ |
| Yellow soap | 6 | „ |
| Gum arabic | 2 | „ |
| Glycerin | 1 | part. |

Dissolve the gum in a small quantity of water, add glycerin, mix in pigments. Then grind to a smooth paste with water and proceed as above.

### LANTERN SLIDE INK

An ink consisting of 3 p.c. solution of celluloid in "Cellosolve" or other similar solvent and coloured sufficiently with crystal violet, or other dye, will write on clean glass, using an ordinary steel pen. Slides can be very easily prepared. It is necessary that the glass be unusually clean and free from any oil film. The dry glass, after washing with soap and water should be sponged with acetone, and the surface must not be touched with the hand during the writing. The handle of a tooth-brush is a satisfactory source of celluloid. The ink dries rapidly and corrections can be easily made after erasing by scraping with a razor blade.

### BONDED ABRASIVE WHEELS

The use of a good grade of animal hide glue is essential. Bone glue, fish glue, and cold glue preparations are relatively insufficient.

Mix by weight only and never heat more than a three hours' supply at any time. For average conditions in the polishing room the

ollowing table of mixtures should act as a uide for setting up wheels.

| Size of grain | % Glue. | % Water. |
|---|---|---|
| 24–26 | 50 | 50 |
| 46–54 | 45 | 55 |
| 60–70 | 40 | 60 |
| 80–90 | 35 | 65 |
| 100–120 | 33 | 67 |
| 150–180 | 30 | 70 |
| 220–240 | 25 | 75 |

Soaking the glue allows it to dissolve more ..ily on heating. Use pure water and ..k.

Ground glue -- One hour or more.
Flake glue -- Six hours or more.
Cake glue -- Twelve hours or more.

The glue should be melted in a water-..eted heater. When the wheels and grain .. preheated, apply the glue at a temperature 140°F. With wheels and grain at room tem..ature, use glue at 160°F. Keep a thermo..eter in the glue pot as a constant check on ..perature.

## LUEING IRON ARTICLES

884 S., Lucknow -Wants to have a recipe blueing iron articles.

| | | |
|---|---|---|
| Caustic soda | 26 | oz. |
| Litharge | 7 | ,, |
| Sodium Cyanide | 2 | ,, |
| Lead Acetate | 2 | ,, |
| Metol | 1 | ,, |
| Water | 50 | ,, |

Mix all together. Heat the solution to ..-134°C. Immerse the iron article into this ..lution for 2-4 minutes. Then take it out.

## REEN MARKING INK.

| | | |
|---|---|---|
| Silver nitrate | 11 | parts. |
| Ammonia solution | 22 | ,, |
| Sodium carbonate | 22 | ,, |
| Water | 12 | ,, |
| Gum | 50 | ,, |
| Sap green | 2 | ,, |

Dissolve the silver nitrate and the ammo..a and the sodium carbonate in the water ..parately. Boil the latter and pour the silver ..tion into it. Then add the gum and colour ..h the sap green.

## FFECTIVE LICE KILLER

| | | |
|---|---|---|
| Benzyl benzoate | 250 | c. c. |
| Triethanolamine | 5 | gm. |
| Oleic acid | 20 | ,, |
| Water | 750 | c. c. |
| To make about | 1000 | ,, |

Mix the triethanolamine with the oleic acid, ..d the benzyl benzoate and mix well. Trans..r the mixture to a suitable container of about ..0 c.c. capacity, add 250 c.c. of water and ..ake thoroughly. Finally, add the remainder of the water and shake thoroughly.

This lotion is applied to affected areas and allowed to dry. It is removed after several hours by washing thoroughly with a mild soap and water. It should not be allowed to get into the eyes, open cuts or wounds. After its use, comb the hair to remove dead lice and nits.

## RAZOR HONE PASTE

929 G.T.C., Meerut -Wishes to have a good formula of razor hone paste.

| | | |
|---|---|---|
| Fine carborundum powder | 6 | lbs. |
| Beef suet (freshly rendered) | 2 | ,, |
| Beeswax yellow | 1 | lb. |

Melt the suet and the wax then incorporate the carborundum powder. Cool and cut into small cubes or put in tin containers while still warm.

## ETCHING POWDER FOR IRON AND STEEL

912 P.P.C., Meerut City -Desires to know a process of etching iron and steel.

| | | |
|---|---|---|
| Blue vitriol | 50 | parts. |
| Common salt | 50 | ,, |

Mix and then moistened with water just before application over iron and steel to be etched.

For lustrous figures on a dull ground the whole surface is polished, the portions which are to remain bright covered with stencils and and the object exposed to the fumes of nitric acid. This is best done by pouring sulphuric acid 20 parts, over common salt 10 parts.

## LUMINOUS PAINTS

953 P.N.C., Anakapalle Desires to know process and formulas of preparing luminour paints.

In the manufacture of luminous pigments the quality and purity of the raw materials are of the greatest importance. The calcium oxide used in most luminous pigments is obtained by calcining pure marble or iceland spar. The sulphur used should be recrystallized from carbon bisulphide. Only purest rice starch and not impure potato starch should be used as reducing agent.

LUMINOUS BASE

| | | |
|---|---|---|
| Calcium oxide | 5 | g. |
| Sulphur | 10 | ,, |
| Starch | 2 | ,, |

This base can be activated with a solution of ½ per cent thorium nitrate and ½ per cent. bismuth nitrate in alcohol slightly acidified with nitric acid. One of the fundamental re-quirements is a good and uniform distribution of the effective heavy metals throughout the whole mass. This is accomplished by grinding thoroughly a portion of the base in the solution and slowly adding more base until all ingre-dients have been mixed carefully.

The colour of the luminescence can be varied and controlled within wide limits. A blue luminescence is emitted by the following pigment:

| | | |
|---|---|---|
| Luminous base | 15 | g. |
| Potassium sulphate | 0.25 | „ |
| Sodium sulphate | 0.25 | „ |
| Bismuth nitrate solution | 0.5 | c. c. |
| Thorium nitrate solution | 1.0 | „ |

This mixture is calcined for fifteen minutes at white heat. The crucible is first charged with a layer of charcoal or coke on which the mixture is pressed and allowed to dry thoroughly. The crucible is then covered with a lid and sealed with a magnesia cement. After calcination is completed the crucible is removed from the furnace and cooled quickly. The resultant luminous pigment should be kept in large pieces in well sealed containers. For incorporation in luminous paints the pigment should be powdered only coarsely since very fine grinding affects luminosity adversely.

The following pigments can be prepared in a similar manner.

YELLOW LUMINOUS PIGMENT

| | | |
|---|---|---|
| Barium oxide | 10 | g. |
| Sulphur | ? | „ |
| Starch | 1 | „ |
| Potassium sulphate | 0.1 | „ |
| Bismuth nitrate solution | 0.5 | c. c. |
| Thorium nitrate solution | 1.0 | „ |

Calcining time 35 minutes at white heat.

GREEN LUMINOUS PIGMENT

| | | |
|---|---|---|
| Strontium oxide | 10 | g. |
| Sulphur | 8 | „ |
| Starch | 2 | „ |
| Potassium sulphate | 0.25 | „ |
| Bismuth nitrate solution | 0.5 | c. c. |
| Thorium nitrate solution | 1.0 | „ |

Other colours can be produced by varying the activating salt. Uranium salts give blue to bluish violet luminescence; cerium salts, reddish-yellow; antimony salts, greenish-yellow; mercury salts, green; manganese sulphide, golden yellow; gold salts, green; copper salts, green; molybdenum sulphide, orange; and lead sulphide, blue-green. Colloidal solutions of metallics or sulphides which can be kept in colloidal solution by the formation of complex salts may also be used as activators.

### HAIR CURLING LIQUID

979 P.P.P., Samarkha -Wishes to have recipes of hair curling liquid, hair removing lotion, etc.

| | | |
|---|---|---|
| Glycerine | 100 | grams. |
| Sodium sulphite | 100 | „ |
| Water | 1000 | c. c. |
| Ammonia (10%) solution | 100 | grams. |

Dissolve the glycerine and the sulphite in the water, and add to this the ammonia solution.

### HAIR REMOVING LOTION

| | | |
|---|---|---|
| Sodium sulphide | 14 | parts. |
| Water | 160 | „ |
| Rect. spirit | 4 | „ |
| Glycerine | 20 | „ |
| Lavender oil | 1 | part. |

Dissolve the sulphide in some of the wa[ter] add the glycerine and mix. Add the remain[der] of the water and finally the lavender oil, [dis]solved in the spirit, mix well and filter.

### PAIN BALM

| | | |
|---|---|---|
| Yellow vaselin | 24 | oz. |
| Methyl salicylate | 2 | „ |
| Oil of cajuput | 1 | „ |
| Oil of eucalyptus | 1 | „ |
| Peppermint crystals | 1 | „ |
| Wool fat | 10 | „ |

Melt the vaselin and wool fat over [a] fire and then remove from the source of [heat] and mix the other ingredients with sti[rring]. Continue stirring until the mass is al[most] solidified.

### PREPARATION OF PAPAIN

1037 C.F., Vythiri—Desires to know process of preparing papain.

The best method to prepare papain [is to] collect the juice of unripe papaw by ma[king] shallow longitudinal incisions about ⅛ inch [deep] in the well grown fruits, by means of a [non-]metallic knife such as a bone or ebo[ny] knife.

Fruits in which only three to four incis[ions] are made simultaneously can be incised a[gain] after a day or two. The juice resembles a w[hite] thin sticky latex which coagulates rapidly.

The fruits should be incised in the [early] morning and the juice strained through [a] [clo]th and dried at about 35°C for two days, wh[ich] forms a cream coloured brittle mass with [an] unpleasant odour. The mass can be groun[d to] a powder.

The juice should be collected in [glazed] earthenware and a trace of formalin add[ed to] the juice which will prevent decompos[ition]. Small quantities of juice may be dried [in the] sun on sheets of glass. Large quantities [how]ever are prepared preferably by spreadin[g the] juice on linen trays made by stretching [the] linen on wooden frames placed over a h[ot air] chamber of bricks avoiding excessive [heat]. For this purpose an iron plate covered [with] 2 to 3 inches of sand between the fire and [the] hot air chamber of bricks avoiding exce[ssive] heat. For this purpose an iron plate cov[ered] with 2 to 3 inches of sand between the fir[e and] the hot air chamber may be used with the t[rays] about one foot above the plate.

Artificial dyeing in this way should b[e] below 100°C. On a large scale however, va[cuum] drying would be found to be very efficient [as the] juice contracts in drying and the contents [of] several trays can be placed subsequently i[n one] to complete the drying. The juice shoul[d be] dried till it is crisp and capable of being redu[ced]

to a powder. A cream coloured or white powder ; obtained. The yield of crude dried material nounts to about 16 to 18 per cent of the weights the juice.

After drying the mass is ground, while still arm in a stone mortar with a stone pestle. he crude product is a white amorphous powder. order to purify this impure substance, it is ated with a sufficient quantity of absolute cohol and it is found that about 75 per cent. the crude mass is dissolved in it. It is then tered and the filterate on evaporation gives e to pure substance; which can be used again.

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**AMARIND SEED KERNEL FOR TEXTILE IZING.**

1048 K.H.K., Bombay—Wants to have a ess of extracting tamarind seed powder for tile sizing.

The curtailment of starches made from food oducts created the textile industry's interest new sizing materials. Since fruit pectin is obtainable either, another kind of pectin de from tamarind seeds has bright prospects. s disposed of as a waste material. Tamarind d is a rich source of pectin for various indusial applications. It constitutes a highly viscous lution in water and additions of borax have n found to appreciably increase its viscosity, d to effect formation of a water-holding gel ese properties approximate the qualities of m tragacanth and tragasol, and in the fabrition of rubber the new pectin is already being ployed as an equal replacement for these bstances. As a sizing material for textiles, is superior to gum karaya and preferably ual to starch. In consideration of the reasonle price, it can be expected to become rmanent.

The sizing material is prepared by heating e seed to 150°C for about 15 minutes, soaking the decorticated kernels in water, and drying em for powdering. Instead of the 7.5 per cent lution employed where tapioca starch is used 5 per cent. solution of the tamarind sizing owder can be recommended for correct viscoty and consistency.

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**ERMILION**

1058 D., Kanpur—Wishes to have good rmula of vermilion.

| | |
|---|---|
| Red lead | 8 lbs. |
| Zinc oxide | 5 „ |
| Venetian red | 1 lb. |
| Vermilion dye | 2 lbs. |

Macerate these ingredients thoroughly in a tone mortar and set aside for 24 hours in a ool place. Finally reduce it to fine powder nd pack.

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**COLOURED CHALK CRAYONS**

1100 P.P.W., Masulipatam — Desires to now formulas of coloured chalk crayons.

WHITE

| | |
|---|---|
| Precipitated chalk | 40 parts. |
| Plaster of Paris | 45 „ |
| Lithophone | 10 parts. |
| Glue solution | 5.10 „ |

Knead all together to make a soft dough and pour into gun metal moulds. When set take out and allow to dry in air. Then put all together in a tray and moderately bake over mild fire.

BLACK

| | |
|---|---|
| Soapstone | 28 lbs. |
| Gypsum | 20 „ |
| Bone Black | 8 „ |

Mix and make into a stiff paste, with thin glue or gum, mould and dry gradually.

YELLOW

| | |
|---|---|
| Chalk | 28 lbs. |
| Soapstone | 18 „ |
| Pipe clay | 10 „ |
| Yellow ochre | 6¾ „ |
| Medium lemon chrome | 1¼ „ |

First well mix ochre and chrome, then add to others, making a paste as before.

BLUE

| | |
|---|---|
| Soapstone | 15 lbs. |
| Gypsum | 15 „ |
| Chinese blue | 1½ „ |

Proceed as before

GREEN

| | |
|---|---|
| Gypsum | 35 lbs. |
| Soapstone | 25 „ |
| Pipe clay | 30 „ |
| Lemon chrome yellow | 7 „ |
| Chinese blue | 6 „ |

Mix Chinese blue and chrome together; add to others, making and moulding as previously.

RED

| | |
|---|---|
| Whiting | 15 lbs. |
| Soapstone | 28 „ |
| Pipeclay | 10 „ |
| Indian red | 7 „ |
| Venetian red | 1½ „ |

Proceed as before.

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**THINNERS FOR CELLULOSE LACQUERS.**

1133 C.R.R., Bangalore—Wants to have good formulas of thinners for cellulose lacquers, hydraulic brake fluid, etc.

| | |
|---|---|
| Acetone | 8 parts. |
| Ethyl acetate | 2 „ |
| Ethyl lactate | 2 „ |

Mix in a well stoppered bottle.

# —READER'S BUSINESS PROBLEMS

**[ Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]**

### STARTING A CAREER WITH SMALL CAPITAL

869 R., Agra—Writes, "I am keen after starting some industry but I have neither capital nor experience. So please advise me accordingly."

It is very difficult on our part to suggest any kind of industry which can be started without any capital. You may however start some mail order business which can be started with small capital and can be worked in leisure time. This business will not yield you any profit in the first two years. In course of these two years you will get experiences that wil be of much help in successive years of your business career. The first atempt that you should make is in marketing some cheap novelties. The large houses do not usually handle such things. So there is not much danger of coming in contact with the class. The most dangerous competition will in probability come from your rival, the small mail order class, the number of which is very limited. But if you are very keen upon starting any kind of small industry you may take up manufacture of ink. Process of manufacturing all sorts of ink will be found in Manufacture of Ink, published from this office, price Rs. 3/7/- including postage.

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### MAKING MONEY IN A SHOP

1148 S.C.B.R., Madras – Wishes to be enlightened on how to make money in a shop.

The most important factor about making money happily in your shop is your attitude towards it. Too many people enter shop life because they think it is an easy way of making money. You buy goods at one price and sell them at another, and the balance is profit.



Actually, making money happily in a shop is one of the hardest ways of choosing a living, but it is also one of the most interesting t...

The fascination of meeting a lot of people, of building up your shop sales, of struggling to master and come out on top of a thousand and one problems that beset the average shopkeeper, is perhaps the main reason for success in a shop.

The second reason for success in a shop is understanding your public. It takes pluck to buy, and it takes skill to buy the right goods. Wrong buying kills the shop at birth. successful shops are built up by skilful, pl... buying and thousands fail because of the failure to accept this first fact.

Some people think buying is a gift-outwardly it is, but I have never met a skilful buyer who is not a master of his line, and his public mind. This skill was not gifted at birth has been built up by long study, careful analysis, wise observation and a ready willingness all times to recognise mistakes one of the most difficult things to bring oneself to do in a shop.

The third reason for success in a shop a desire to grow. Folk who start a shop as heaven, generally make it a cemetary wh... they bury their fondest hopes. As you read, there are many ways to grow, as long you will grow. On the law of average your shop is but your lengthened shadow. As you grow inside, the evidence in outward visible form.

Making a shop pay is a full and absolute task, for to make it more, calls for hard thinking allied to hardwork. Successful shops ... more when they reflect prosperity. Even if you are having a bad time, begin to think good time. Get outside your shop the first opportunity and ask yourself "Does my shop radiate prosperity?" Because although the public ought help the shop that needs help the most generally patronises the shop that looks though the shop confers the favour by ... open.

Make your shop look what you want it be. Remember, the onus is on you and not the customer, If the customer does not ... with you as you want him to deal, it is your fault. Make your store active, prosperous and good-looking. Show movement and vitality. If necessary paint up and clean up. D... windows more often; send out more samples. Have competitions among the salesmen. ... something to let the public know you are moving.

# —BRIEF QUERIES AND REPLIES

[Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.]

901 A.N.V., Ludhiana — Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

902 K.L.G., Bilaspur—Refer your query to The Controller of Exports, New Delhi.

908 M.A., Hyderabad—We have no book on synthetic perfume manufacture. You better try at Thaker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

909 K.S.N., Trichur—An article on ink manufacture appeared in April, 1950 issue of Industry. We have also a book Manufacture of Ink, price Rs 3/9/- including postage.

911 C.F.W., Wattala Fancy tin cans may be had of Bengal Tin Box Mnfg. Co., 1, Jadu Nath Mitter Lane; National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street and Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur; all of Calcutta.

913 I.X.P., Chilaw—Optical goods may be had of Eastern Optical & Co., 306, Bow Bazar Street; Geneva-Optics & Co., 5, Bow Bazar Street; James Murray & Co. Ltd., 5, Old Court House Street; and New Indian Optical Co., 257 3, Bow Bazar Street; all of Calcutta. There is no institute that teachhes optician's course by correspondence.

915 S.H.J., Farrukhabad You may add the powder to the oil and stir vigorously, let the oil settle completely for 24 hours. Now decant the oil and filter.

917 M.S., Gauhati—You should make arrangement for vacuum packing of fish pickles to prevent fungus. For preserving lemon juice you may use potassium metabisulphite in the proportion of 1 part in 1000 parts of lemon juice.

918 M.P.D., Bishnupur — For rope and string making machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta 1.

920 S.V.K., Hubli — Cigarette making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

922 J.P.S., Moradabad—You may consult Plastic Industry published from this office, price Re. 1/8/- including postage. Plastic mould may be had of Francis Klein & Co. Ltd., 1, Royal Exchange Place and Alfred Herbert (India) Ltd., 13/3, Strand Road; both of Calcutta. Moulding powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

923 P.G.M., Cachar—Motor accessories may be had of Howrah Motor Co. Ltd., Mission Row Extension, Calcutta; Premier Automobile Ltd., Construction House, Ballard Estate, Bombay and Standard Auto Parts Co., 2-30, Mount Road, Madras. Tarpaulin may be had of Asher & Co., Vadgadi, Bombay; Manton & Martin, 70, Netaji Subhas Road, Calcutta and Roberts McLean & Co. Ltd., 31, Netaji Subhas Road, Calcutta.

924 D.A., Wai—For wood working machines enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension; both of Calcutta. Colour may be had of Imperial Chemical Industries (India) Ltd. 18, Strand Road, Calcutta. Yes, you may use deodar wood for making toys. You may start this business with Rs. 5000 as initial capital.

925 S.C., Cannanore For Income Tax Manual enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

926 C.M.V. Baroda Carnauba wax, shellac wax, etc. may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Banshidhar Dutt 126, Kengrapatty Street; both of Calcutta.

927 M.M.D., Bangalore Refer your query to British Trade Commissioner, 1, Harrington Street, Calcutta.

928 C.M.P., Alwar—No such institutions are available.

929 G. T. C., Meerut Process of manufacturing sharpening whet stone will appear in due course.

932 R.J.L.F., Udaipur All the ingredients may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

936 J.S.P., Arcot—We are not aware of the use of formalin in paper manufacture. For photo paper enquire of Photographic stores & Agency Co. Ltd., 151, Dharamtala Street Calcutta.

937 S.K.D., Gauhati Battery acid used in storage batteries is diluted sulphuric acid. By mixing one pint of pure sulphuric acid with 4 pints of distilled water dilute sulphuric acid of 1.200 sp. gravity is obtained which may be used as battery acid. Umbrella handle making machine is not available

939 S.C.V., Shivpuri We are not aware of the particular of sitawara.

941 M.B.P., Saharanpur—Following is formula of iron slate coating: First prepare the silicate solution by finely crusning equal parts of solid potash and soda silicate and pouring over this 6 times the quantity of soft river water, which is kept boiling for abou

14 hours, whereby the silicate is completely dissolved. Next take 7 parts of slate finely ground with a little water into impalpable dust and mix with 1 part lamp black. Grind enough of this mass with the previously prepared silicate solution as is necessary for a thick or thin coating.

942 P.P.C., Meerut City—We have no book on tin printing. Process of etching steel will appear in due course.

943 M.I., Charkhasi--We are not aware of any institution where training is given on cinematography

945 A.B., Barajamda -For paper pin making machine enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

948 S.I.E., Ottapalam -Particulars regarding glass electrodes are not available Process of manufacturing rubber stamp will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/9/- including postage.

952 L.R., Bhadrak--Following is a recipe of vermilion or sindur: Red lead 8 lbs ; Zinc oxide 5 lbs.; Venetian red 1 lb.; Vermilion dye 2 lbs. Macerate these ingredients thoroughly in a stone mortar and set aside for 24 hours in a cool place. Finally reduce it to fine powder and pack.

953 P.N.C., Anakapalle -Process of manufacturing luminous paint will appear in an early issue of Industry.

954 B.R R., Anakapalle— Process of making neon glow sign will appear in an early issue of Industry.

955 R.K.P., Lucknow -Process of manufacturing rose water will appear in due course.

963 S.N.G., Calcutta- For machine parts and other appliances of required design write to Industrial Machine & Tool Manufacturing Co., 41, Panchanantola Road, Howrah.

964 H.S D., Bhusawal -Case hardening compound is used for hardening steel or other metals. In case hardening certain articles it is sometimes necessary or desirable to leave spots or sections in the original soft uncarbonised condition while the remainder is carbonised and hardened.

967 B.N.O., Rajkot—Process of preparing ghee will be found in Milk and Milk Products published from this office, price Rs. 3/9/- including postage. You should arrange for vacuum packing of ghee.

973 B.N.S., Moradabad—For Derby tickets write to The Secretary, Royal Calcutta Turf Club, 11, Russel Street, Calcutta.



974 S.K.M., Bombay—You have to varnish to leather. A formula of leather nish is given below: An excellent varnish leather can be made from the following re Heat 400 lbs. of boiled linseed oil to 212°F add little by little 2 lbs. of bichromat potash, keeping the same temperature. addition of the bichromate should about 15 minutes. Raise to 310°F and gradually during 1 hour at that temperatur lbs. of prussian blue. Heat for 3 hours gradually raising to 482° to 572°F with cons stirring. In the meantime heat togethe 392°F for ½ an hour, 25 lbs linseed oil, 3 copal, 75 lbs. turpentine and 7 lbs. cer Mix the two varnishes and dilute, if nece when cold with turpentine. The varnish quire to be warmed for easy application the brush.

976 I.I.D., Calcutta—Following is a li turpentine and rosin manufacturers: Bha Rosin & Turpentine Factory, Bhagwan Road, Hoshiarpur; Himalaya Rosin & Tu tine Mfg. Co., Rikhikesh, Dehra Dun; Nat Rosin & Turpentine Mfg. Co, 27, Baran Ghosh Street, Calcutta and Soni Rosin Fac Bharwain Road, Hoshiarpur.

979 P.L.P., Samarkha Formulas of curling liquid, pain balm and depilatory l will appear in due course.

980 M.P.P.C, Bhilwara Reply to query appears in June issue under No. 59.

983 S.K.K., Ludhiana -For power l enquire of the following firms: Brita Engineering Co. Ltd., 28, Dalhousie Sq Calcutta; Imperial Engineering & Text 67 B, Netaji Subhas Road, Calcutta and Hin than Loom Co. Ltd., 5, Bank Street, Bombay

984 K.M.R., Bhagalpur—It is very dif on our part to suggest names of firms inte in dry chhana to be used in manufact casein.

985 U.P.T., Moulmeingyun--In orde produce pale colour you should mix a quantity of tannin.

988 R.G.P., Sabarmati—Glass bottl be had of Victoria Glass Works, 130, M Bazar Street; Krishna Glass & Silicate W Ltd., 17, Radha Bazar Street, and Jayanti Works Ltd., 8, Ezra Street ; all of Cal For labels and perfumes enquire of F N, Sn 37, Canning Street; Paradise Perfumery H 7, Colootola Street and Sikri & Co., 55, Ca Street; all of Calcutta.

990 A.C.R., Madura—Following is a mula of French polish: Shellac 4 oz.; San 1 oz. ; Sand 4 oz.; Methylated spirit 2 Powder the sandarac and shellac, mix wi sand, and dissolve in the spirit. Decant clear portion and filter the remainder

991 U.P., Palasbari—We cannot vouc opinion regarding financial position and re tability of any individual firm.

992 S.L.V., Sujanpur—For soda w making machines enquire of Essence & E Supply Agency, 14, Radha Bazar Stree Oriental Traders, 5, Ezra Street; bot Calcutta.

993 N.R.R., Ipurupalem—Your letter is unintelligible.

994 R.C.C., Jaora—For paper toys write to Bepin Behary Dass & Grandson, 63F & G, Radha Bazar Street, Calcutta.; Doll, Dummy & Toy Manufacturing Co., 27, South End Park, Ballygunge, Calcutta, and Fancy Toy Works, Outside Dariba Kalan, Delhi and Hari Charan Dass & Co., 63H, Radha Bazar Street, Calcutta.

996 H.N.B., Kamrup—Following is a formula of chalk crayons: Precipitated chalk 40 parts; Plaster of Paris 45 parts; Lithopone 10 parts; Glue solution 5-10 parts. Knead all together to make a soft dough and pour into open metal moulds. When set take out and allow to dry in air. Then put all together in a tray and moderately bake over mild fire.

997 K.K.D., Kanpur—No such herb is available. Braying is making paste with the addition of water. Seeds should be removed. Process should be continued for 6 months, treating each batch of oil for one month.

998 M.M.II., Olavakkot—For grinding machine enquire of Industrial Machine & Tool Mnfg. Co., 41, Panchanontola Road, Howrah and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

999 C.L.A., Indore—Electroplating appliances and raw materials may be had of S. Mitra & Co., 30, Bentinck Street, Calcutta; Alfred Herbert (India) Ltd., 13-3, Strand Road, Calcutta and P. Orr & Sons, Mount Road, Madras.

1002 D.K., Bombay First of all apply a coating of shellac varnish then set cork sheet to the cap by means of pressure.

1003 B.A.P., Madras All the addresses you require will be found in Industry Year Book & Directory, published from this office, price Rs. 16/4/- including postage.

1006 I.S., New Delhi Sewing machines manufactured by Jay Engineering Works Ltd., 183, Prince Anwarshah Road, Dhakuria, Calcutta and K. C. Mullick & Sons Ltd., 77 B, Lower Amtala Street, Calcutta You may try to be an apprentice in one of the above factories. You will require at least Rs. 10 lakhs for starting a sewing machine manufacturing concern.

1007 J.C.A., Kalimati For barometer enquire of the following firms: Adair Dutt & Co. Ltd., Stephen House, 5, Dalhousie Square, East Calcutta; Bengal Apparatus Manufacturing Co., Ultadanga Junction Road, and Indian Scientific Stores, 11-2, Old China Bazar Street; all of Calcutta. Glass syringe may be had of Scientific Glass Apparatus Co., 5A, Prosanna Kumar Tagore Street, Calcutta and Scientific Supplies Co. (Bengal) Ltd., C37-3, College Street Market, Calcutta.

1009 J.P.M., Moradabad—You may take up manufacture of Zarda, Surti and Kimam which may be started on home industry basis with Rs. 2000/-. You may also start shoe lace manufacture. Process of making zarda, surti and kimam will be found in Indian Tobacco and Its Preparations published from this office, price Rs. 3/9/- including postage.

1010 A.N.S., Dacca—An article on snuff manufacture appeared in April, 1950, issue of Industry. If you go through the article you will get all the information regarding snuff manufacture.

1011 B.O.H., Calcutta Process of manufacturing Zylonite sheet will appear in due course.

1015 D.P., Monghyr—We are not aware of Materia Medica in Hindi. You may however enquire of the following booksellers:—Educational Book Depot, Katra Road, Allahabad and R. S. Ram Dayal Agarwala, 216, Katra, Allahabad.

1016 S.S.C., Kakinada- Silicate of soda may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane; Punjab Silicate Works, 28, Bagmari Road and Raj Silicate & Chemical Co., 26, Burtolla Street; all of Calcutta.

1017 V.D., Anakapalli- Process of manufacturing batteries will be found in Manufacture of Batteries published from this office, price Rs. 3/9/- including postage.

1021 B.I., Salem Process of manufacturing lac or shellac appeared in May, 1951, issue of Industry. Seed lac is known as raw lac as obtained from branches of trees. Shellac is manufactured from seed lac.

1022 H.F.W., Rajasthan -Following is a list of cycle parts and accessories manufacturers Hindusthan Bicycle Manufacturing & Industrial Corporation Ltd., Phulwari Sharif, Patna, India Cycle Manufacturing Co. Ltd., 9, Tiljala Road, Calcutta and Sen Raleigh Industries of India Ltd., Mercantile Bldg., Lall Bazar, Calcutta

1023 N.R.L.F., Kanpur Printed tin cans may be had of Metal Box Co. of India Ltd., B-2, Hide Road, Kidderpur, Calcutta and National Sheet and Metal Works Ltd., 36A, Sahitya Parishad Street Calcutta. Plastic machine may be had of Francis Klein & Co Ltd., 1, Royal Exchange Place and Alfred Herbert (India) Ltd., 13 3, Strand Road; both of Calcutta.

1024 S.D., Calcutta Following is a list of herb dealers of Kashmir Fairways. Post Box 51, Srinagar and Kashmir Herbal Cottage, 7th Bridge, Sarai Safa Kadal, Srinagar.

1026 P.C.S., Miraj—For rivets enquire of the following firms: A. M. Mullick & Co., Guptu Mansion, 85A, Netaji Subhas Road; Indestro (India) Agency, 38, Netaji Subhas Road; Lallubhai Amin Chand, 554, Kansara Chawl, Bombay; Modern Engineering Works, 12, Jadu Pandit Road, Beadon Street, Calcutta; Rayes Agency, 20, Strand Road, Calcutta and U. N. Ghose & Co., 61, Netaji Subhas Road, Calcutta.

1028 C.C.L., Kakinada—Following is a list of porcelain factories: Bengal Porcelain Co. Ltd., 3, Moti Seal Street, Calcutta; Calcutta Potteries Ltd., 8, Lyons Range, Calcutta; Bengal Potteries Ltd., 45, Tangra Road, Calcutta Gwalior Potteries, Gwalior; Perfect Pottery Co., 3-24, Thambu Chetty Street, Madras and M. Roben & Co., 14-2, Old China Bazar Street, Calcutta. You may negotiate with the above firms for your requirement.

1031 P.V.K., Madras—It is not possible to detect adulteration of coconut oil without chemical analysis.

1034 P.N.R., Karaikudi—Refer your query to The Consul General for Belgium, "Morena," 11, Carmichael Road. Bombay.

1035 H.P.B.S., Dhoraji—For selling clay you may negotiate with the following Clay Modellers: Aswini Kumar Paul, Krishnagar; Bholaram, Kanda Bazar, Taketganj, Lucknow; N. C. Paul & Sons, 267, Upper Chitpur Road, Calcutta and Ramesh Studio, 2, Raja Naba Krishna Street, Calcutta.

1036 P.C.W., Ludhiana—Inform us that Hindi equivalent of pyrethri is Akarkara.

1037 C.T., Vythiri—Process of manufacturing papain will appear in due course.

1038 D., Kanpur—Process of manufacturing vermilion will appear in due course.

1039 F.C.P., Shikohabad—Hindi equivalent of pyrethri is Akarkara.

1044 R.L.S., Jullundur—You may use benzoic acid for preserving syrup in the proportion of 1 part of the acid in 1000 parts of sugar used in making syrup.

1046 L.S.C.R., Bhadrak—For taking agency of cigarettes you may negotiate with the following firms: Imperial Tobacco Co. of India Ltd., Virginia House, 7, Chowringhee Road, Calcutta; Mohammed Usuf, 59, Canning Street, Calcutta and National Tobacco Co. of India Ltd., Agarpara, 24-Parganas.

1048 K.H.K., Kalyan Camp—Process of manufacturing starch from tamarind seeds will appear in due course.

1049 M.S., Kanpur—Process of manufacturing sodium sulphate will be found in any book on chemistry.

1050 R.K.B., Bhilsa—Following is a list of cutlery dealers: H. Baker & Co. Inc., 101, Duane Street, New York 7, U.S.A.; Imperial International Corporation, 1776, Broadway, New York 19, U.S.A.; A. M. Goonda & Sons, 58, 25th Street, Rangoon; B. C. Shah & Co. 53-58, Moghul St., Rangoon and Mg Ba Tin Bros., 535, Dalhousie Street, Rangoon. Following is a list of piece-goods dealers: Abdul Gani Ahmed, 62-68, Edward Street, Rangoon; Noor Mohamed Haji Mohamed & Co., 20, Edward Street, Rangoon; Allied Universal Ltd., 39, Costland Street New York, 7, U.S.A. and Leona Fabrics Co., 360, Broadway, New York 13, U.S.A. Following is a list of dealers in pharmaceutical preparations: E. Foundera & Co. Inc., 75, Warick Street, New York 13, U.S.A; European Chemical Co. Inc., 366, Broadway, New York 13, U.S.A.; Capital Pharmacy, 108, Moghul Street, Rangoon; Grand Pharmacy, 138-44, Moghul Street, Rangoon and Burma Pharmacy, 372, Moghul Street, Rangoon.

1051 A.V.A.C.F.C., Coimbatore—Following is a list of rich men of India: Ghanshyamdas Birla, 8, Royal Exchange Place, Calcutta; Aga Khan, Aga Hall, Bombay; Tyebhoy Abdool Kader, Nagdevi Street, Bombay 3; Rai Bahadur Chandumal Balchand, Mount Road, Coonoor; Sir Vithal Narayan Chandra Varker, 41, Pedder Road, Cumballa Hill, Bombay; Sir Ardeshir Rustomji Dalal, Bombay House, Bombay; Seth Ram Krishna Dalmia, Dalmia Jain Nivas, New Delhi; Rai Bahadur Sir Badridas Goenka Navas, 19, Belvedere Road, Alipore, Calcutta; Bimala Churn Law, 43, Kailash Bose Street, Calcutta and Brij Mohan Krishanlal Maroo, 158, Old Kalbadevi Road, Bombay.

1052 H.S.S., Bellary—For cinema slides enquire of The Symposium Publicity & Propaganda Service, 22, R. G. Kar Road, Calcutta.

1051 G.S.P., Berhampur—You may consult Indian Textile Journal, Surya Mahal, Military Square, Fort, Bombay. For canvas enquire of Adhikary & Co., 21A, Canning Street; Dambala Dealers Ltd., P23 & 24, Radha Bazar St., both of Calcutta. Following is a list of cloth dealers: Bombay Cloth Market Ltd., 13, Princess St., Bombay; Jethabhai Ramdas & Co., Mulji Jetha Market, Bombay; Mahadyal Premchand, 187, Harrison Road and Modern Cloth Stores, 209, Harrison Road; last two are of Calcutta. Following is a list of hosiery dealers

...brahim Bros., 25, Zakaria Street; Bengal ...ery, 31-32-33, Chandney Chowk and ...uddin & Co., 7, Colootola Street; all of ...utta. For umbrellas write to Akshoy ...ar Paul, 112, Khengrapatty Street; ...ia Lall Dutt & Sons, 49B, Harrison ...d and Nundo Lal Paul & Co., 125 & 126, ...hina Bazar Street; all of Calcutta.

...58 Y.V.R., Amalapuram — Address of ...Glass Works is 147/B, Raja Dinendra ... Calcutta. Address of Bharat Glass ... Ltd. is Belgharia, W. Bengal.

...61 U.C.T., Agra — A good formula of ... hair oil appeared in March, 1951, issue ...ustry. In this connection you may con... Indian Perfumes, Essences and Hair Oils ...sued from this office, price Rs. 1/9/- ...ing postage.

...66 A.S.A., Delhi—For patent and trade ... registration write to Dutta & Co., 82, ...son Road and Law Morris & Co., 19, ...d Road; both of Calcutta.

1067 D.G.P., Lashkar -Vernacular equi... ts of the ingredients are not available. ...wood, brazil wood, resin etc., may be had ...anshidhar Dutt, 126, Khengrapatty Street, ...utta. Carmine may be had of Fuzlehussein ...Bros., 44, Armenian Street, Calcutta. Rosin ...nd rosin soap may be had of Calcutta ...mical Co. Ltd., 10, Bonfield Lane, Calcutta

1068 W.U.H., Partabgarh—Chemicals may ...had of Calcutta Chemical Co. Ltd., 10, Bon... Lane, Calcutta. Minerals may be had ...alcutta Mineral Supply Co. Ltd., 31, Jackson ..., Calcutta. Dyes may be had of Fuzlehus... & Bros., 44, Armenian Street and Champalal ...wala, 45, Armenian Street; both of Calcutta.

1070 P.B., Hyderabad An article on ...nufacture of sizing from tamarind seed ...nel appeared in March, 1951, issue of Indus... For grinding machine enquire of Balmer ...vrie & Co. Ltd., 103, Netaji Subhas Road ... T. E. Thomson & Co. Ltd., 9A, Esplanade ...; both of Calcutta. Process of sizing arti...l silk will appear in due course.

1071 M.H.W., Rajkot- We have no book ...working of a hosiery machine. You better ...uire of Thacker Spink & Co. (1933), Ltd., 3, ...lande East, Calcutta.

1072 A.J.M., Wadakanchery - You may ...ult Modern Pottery Manufacture by H. N. ...sh published by Ceramic Publishing Co., 1, ...rch Road, Bhagalpur.

1073 C.S.M.I., Kanpur -Following is a list ...waterproof manufacturers: Bengal Water... of Works (1940) Ltd., 32, Theatre Road, ...utta and India Waterproofing Co., Hasan ...mbers, Corner of Parsee Bazar Street and ...ga Street, Bombay.

1074 T.R.C., Indore City—For particulars of agents of Tata Iron & Steel Co. Ltd., 102, Netaji Subhas Road, Calcutta write direct.

1075 R. J. P., Ahmednagar — Process of manufacturing macaroni will appear in due course.

1076 G.V.R., Vizianagram—Plastic machine may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta.

1077 M.C.J., Amroha For plastic cases enquire of Popular Plastic Products, 4, Upper Chitpore Road, Calcutta; Dhoomi Mal Dharam Das, Chaori Bazar, Delhi and Popular Plastics, Ruby House, Opp. Colaba Tram Terminus, ... to 5 Glass Phials may be had of Balsukh Glass Works, 7, Swallow Lane; Economic Glass House, 25A, Swallow Lane and Hind Glass Works Ltd., 55, Chittaranjan Avenue; all of Calcutta.

1078 K.J.K., Kottayam - For asphalt enquire of Universal Asphalt Products & Construction Co. Ltd., Citadelle, Queens Road, Bombay and Standard Vacuum Oil Co., Imperial Chambers, Wilson Rd., Ballard Estate, Bombay.

1079 P.P.N., Chittoor- Mira products may be had of Mira Chemical Industries Ltd., 11A, Prince Anwar Shah Road, Tollygunge, Calcutta.

1083 H.S.S., Hariana—For lottery tickets enquire of Royal Calcutta Turf Club, 12, Russel St., Calcutta.

1084 K., Moradabad—An article on gilding appeared in October, 1950, issue of Industry. If you go through the article you will get detailed information about gilding.

1086 M.A., Madras — You perhaps mean fountain pen ink. Formulas of good fountain pen ink will be found in April, 1950, issue of Industry. Following is a list of fountain pen ink manufacturers: Sulekha Works Ltd., Jadavpur, Calcutta 32; J. B. Dutt & Co., 167, Old China Bazar Street, Calcutta; P. M. Bagchi & Co., 19, Gulu Ostagar Lane, Calcutta; Viswa Sambhar Products, 5, Tobin Road, Calcutta 35, and Skolar Ink Company, 11-2, Old China Bazar Street, Calcutta.

1087 G.M.M.C., Bombay —A formula of good snow appeared in April, 1950, issue of Industry.

1089 J.D., Lucknow For cold storage plants enquire of American Refrigerator Co., 69, Dharamtala Street; British Refrigerations, 30A, Chowringhee Road; F. & C. Osler Ltd., 12, Old Court House Street; M. S. Vernal & Co., Bharat Insurance Bldg., Chittaranjan Avenue South and Refrigerators (India) Ltd., 59C, Park Street; all of Calcutta. Instructions regarding working the plants will be supplied by

transformations that take place in the individual. A new mental phase develops at the age of thirteen. The book makes an interesting study of the changes of mentality taking place in the child and advocates a new system of education which will allow the children to develop normally. The book is a fine exposition of Montessori system of education which is getting popular all over the world and as such should merit careful perusal by teachers of boys and parents as well.

# NOTICES & REVIEWS

**(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this section.)**

### NOVEL WOODWORKING MACHINERY

The pressing need of India to-day is after the food problem—the housing problem. Man wants to build his house in the shortest time, at the cheapest cost with greatest convenience It is only ingenious machines that can do the transformation of the rough trees into fine building materials in no time.

The well-known South-Indian Industrialist Mr. G. D. Naidu managed to get a complete set of the FESTO Woodworking Machines to India during his last tour to Germany. The FESTO Machines exhibiting the great German technique will be a boon to the industrialists.

Mr. Kurt Stoll, the son of the manufacturer of these machines is also on a holiday trip in Coimbatore, and is demonstrating the machines at the Industrial Educational Exhibition in Gopal Bagh, Coimbatore sponsored by Mr. G. D. Naidu.

A list of the machines whose advertisement is appearing elsewhere in this issue is given below:

FESTO Chain Saw for Felling Trees and for Cutting to length. Available either with electric motor or with petrol engine for taking out to the forest where no current is available The outstanding feature of these machines is the extreme easy manipulation.

FESTO Parallel Saw for all kinds of cutting wood up to eight inches cutting depth: cutting to length, angle cutting, cutting rafters, edging, grooving etc.

FESTO Universal Carpentry Machine another useful machine for house construction: for mortising, drilling, milling string boards, pointing dowels, grinding etc.

FESTO Universal Planing Machine for Carpentry Work which saves very much time and gives you a smooth and clean surface: for planing, surfacing, grinding, milling, sawing, boring etc.

FESTO Electric Hand Band Saw which has the advantage of being stationary and protable too.

FESTO Electric Hand Circular Saw from which two different sizes are available; one up to 3½ inches cutting depth and another one up to 6 inches cutting depth. Both can be used portable or as an ordinary stationary table saw.

FESTO Motor Disc Sander which helps you in doing all kinds of sanding and finishing jobs. More than 10,000 in use are working to the full satisfaction of their users.

FESTO Chain Mortising Machine for making the joints for doors, windows, chairs, tables etc. with built-in switch and only one working lever.

FESTO Tenoning Machine which contains three machines in one; for it cuts to length, cuts the tenon and cuts the counterprofile of the tenon-the slot in a very short working procedure and absolute accurate.

FESTO Shutter Grooving Machines for making all kinds of grooves.

FESTO Polishing Machine which gives four five times more efficiency than by hand polishing and which is unrivalled in capacity.

All these woodworking machines are now available in India.

### FOUNTAIN PEN INK AND DENTAL FLUID

We have received from S. N. Tenell, Shahabad, one phial Free-Flow ink which is found to be satisfactory.

We have also received from them one phial of Tenell's Dental fluid, said to be a germicidal preparation, which prevents pyorrhoea and cures toothache.

### NIBS

We are glad to receive two samples of nibs, one of which is for red ink and the other is relief nib. These are manufactured by C. Karmakar & Co., Anandapuri, Barrackpore, 24 Parganas, West Bengal. We have tested the nibs and found to be good and serviceable

### LIFE INSURANCE DIRECTORY, 1950

We regret that in the last issue some error crept in in reviewing the book on page . column 2 The name of the book was wrongly given as the Insurance Directory 1950 which should be Life Insurance Directory 1950. The publishers of the book are Chhaya Publications Ltd., and not Chhaya Publishers Ltd., as stated there through mistake.

# TRADE ENQUIRIES

**(To communicate with any party write to him direct with name and address given below mentioning Industry.)**

1032 B.R. Tibarawala, Ratan Nagar, Bikaner -Wants to be put in touch with the suppliers of Coptia Tecta and Leopard stone.

1071 T. Ram Chander & Co, 15, Mahatma Gandhi Road, Gali. No 1, Indore City Wants to be put in touch with the manufacturers of shoe tacks, penal pins and rivets, china clay mine owners in Chaibasa Kendposi, Bombay Presidency and Kathiawar and tamarind seed flour and tapioca flour manufacturers of Madras and Mysore.

*1125 National Stores, Kamptee, (M.P.)* Wants to be put in touch with the wholesale dealers in fish.

Estd. 1890
SA
FOR
CARDBOARD BOX
& QUALITY
PRINTING
S. Antool & Co. Ltd.
CONTRACTORS TO THE GOVT OF INDIA
91, UPPER CIRCULAR ROAD.
CALCUTTA-9

CALCUTTA, SEPTEMBER, 1951. No

## INDUSTRY.

**A Monthly Magazine for Manufacturers and Businessmen.**

**Published in the first week of the month by INDUSTRY PUBLISHERS LTD., 22, R. G. Kar Road, Calcutta-4.**


**EDITORIAL CONTENTS FOR**

**September, 1951**




**BUSINESS NOTICE**

**SUBSCRIPTION DEPARTMENT.**

| | |
|---|---|
| Annual Subscription, Indian | Rs 6/- |
| Foreign | Sh. 12/- |

Including postage, but excluding V.P. and Registration charges.

| | |
|---|---|
| Single Copy (ordinary issue) | As. -/8/- |
| „ „ Special Issue (4 times a year) | As. -/10/ |
| „ „ Foreign | Sh. 1/- |

Subscribers are enlisted at any time of the year for a period of 12 months. Subscribers will receive 12 issues in all beginning with the issue for the month of enlistment. Subscribers are not enlisted for any period less than a year.

Subscription money is always payable in advance or by V.P.P.

**ADVERTISEMENT DEPARTMENT.**

Last day of accepting advertisement is the 10th day of the previous month. Any order for alteration or correction of copy is not entertained after that day.

Advertisement rates for ordinary and special position, both casual or contractual, are sent on request.

**CORRESPONDENCE.**

All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

**OFFICE HOURS.**

| | |
|---|---|
| Editorial Department | 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays |
| Subscription and Advertisement Department | 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays. |

# —CLASSIFIED BARGAINS

DVERTISEMENTS under this head of small announcements cost 4 As. per word, minimum s. 3 payable by Postage Stamp or M.O. with order. No vouchers given.
Readers—In writing to advertisers the Readers are requested to write legibly and quote iat they are writing in response to advertisement in INDUSTRY. This would ensure prompt :tention. Letters to Advt. No. should be duly stamped.

**LIST OF CLASSIFICATIONS**



## AGENTS WANTED

**For Calendars, Diaries, Handbags, Purses,** and-Gloves. Apply Bengal Leather Industries, l/c. St., James Square, Calcutta 67 AA

**"Rukte-Gandeeve" — Latest Discovery—For** eight and Fattness." Agrawal & Sons, 'alpur, M. P. - 469 AA

**Bangaluxmi Leather Works, 10/B, St., James** quare, Calcutta—Wanted Stockists for money urses and Ladies Hand Bags. 63 AA

**D. D. Malam—A Soothing Ointment for all** kin Diseases, never stains on clothes. Wanted gents, Mahatma & Co., Jorasanko, Calcutta 7. 438 AA

**Wanted Agents to Earn 500/- Monthly** orking for Embossers, Nameplates, Locks & aning machines. Apply International Indus-es Ltd., Telephone No. 144 Aligarh. 69 AA

**For "Organisers and Agents" on suitable** erms, apply Oriental Provident Insurance Ltd. 3, Canning Street, Calcutta. Phone Cal. 7175. 76 AA

**Wanted Agents, Organisers and Stockists.** or pushing our medical products, for terms ply:—Medical Health Institute Ltd., 82, arrison Road, Calcutta 9. 140 AA

**Wanted agents and stockists for Ayurvedic** edicines and patent preparations. Apply to yurved Research Institute, Santipur, Nadia. 326 AA

## AGENTS WANTED.

**"Earn Rs. 300/- per month in your Locality:** Lion Fabrics Mills, Ludhiana." 460 AA

**Wanted Commission Agents to Canvass** orders for hand-loom products. Terms liberal. Reghuraj Textiles, Chovva. 473 AA

**Hooparin for Cough, Cold Whooping** Cough and Asthma. Madhav & Co., Jorasanko, Calcutta 7. 66 AA

**"Wanted Agents to push sales of our metal** goods. Apply, Federal Trading Co., Aligarh U.P." 479 AA

**"Wanted Stockists for high class fancy** wooden, Plastic, Tin, Enamelled toys and Enamelled Potteries, contact: Navbharat Company, 105, Chhotipeary, Banaras." 300 AA

**"Wanted Agents and Stockists for our** Electroplated articles. Descent Terms. Apply Oriental Commercial Syndicate Jagannaickpur, Kakinada. Telegrams: Plating." 435 AA

**Raja Engineers Sheffield File Knives.** Germantune Harmonium reeds. Boon for Stockists. Nath Trading Co. Gurmandi, Delhi. 315 AA

----Wanted Agents & Stockists for Plastic, Nut Buttons & Alkathyne cycle grips. Terms attractive. Oriental Products. 8, Masjid Bari Lane, Neogypara, Calcutta 36. 410 AA

**"Wanted Stockists & agents to secure orders** for our writing pencils and slate pencils on commission basis. Apply for terms to:--Indian Pencil Works, Azamgarh U.P., 474 AA

**Wanted Stockists and Agents for "Vir"** Fountain Pen ink and other products. M/s. Sukha Nand Chhedalal Sikandarabad, U.P. 148 AA

**"Wanted Agents for all kinds of Buttons,** Sewing thread balls and other tailoring materials. Apply Industrial Distributors, P.O. Box No. 2505 Karolbagh, New Delhi 5." 152 AA

**Agents required for Kashmir gifts. Terms** Charming Samples Rupees Nine. Golden chance Dry fruits in ten pound parcels availables. Rs. 10/6/-, including postage. Omkar Brothers Anantnag Kashmir 160 AA

**Wanted:—Agents, Stockists for a India** Buttons gold-plated. 3 years guaranteed. Terms attractive, Sample's cost Rs. 10-. Universal Traders 1-1A, Subol Chandra Lane, Calcutta-9. 6 AA

**Wanted:—Wholesale Dealers for our own** make first class "Mullick" Brand Rotary Treadle Sewing Mechinees. Thousands are already in actual use with reputation. K. C. Mullick & Sons, Ltd., 77-13, Dhar-m'alla St., Calcutta. 72 AA

**Wanted Really capable agents to push the** sale of our highly concentrated Essences and Food Colours and Synthetic Almond Oil best for soaps, perfumery and other external application to the human body. For best terms apply. Chyavan Chemical Corporation Regd., Goraya Dist Jullundur E.P.R. 459 AA

## AGENCIES WANTED

**Agencies Wanted for Chemicals, Minerals,** Paints. Glass and all varieties of Raw and finished products. Dawn & Co., 11, Portuguese Church Street, Calcutta (Estd. 1906). 50 AG

# ANALYTICAL WORKS

**For Analysis of all sorts of Ores, Minerals, Chemicals, Oils, Oil cakes, Oil seeds, Butter, Ghee, Herbs, Lac products, Soils, Perfumes etc. etc. Write to Chemical Director, Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta 4.** 440 AW

# BOTTLES & CORKS

**Bhagya Laxmi Glass Agency. P-33, Pollock Street, Calcutta—1.** Dealers in all sorts of Bottles, Phials, Corks, Caps, Capsules, Homeo phials, Glasswares, etc. 375 BC

**Nath & Bros., 67, Ezra Street, Calcutta.** Dealers in Empty Bottles, Phials, Corks. 437 BC

**We manufacture mould for glass wares** e.g. files bottles, etc. A. M. Banerjee, 34, Ezra St., Calcutta. 125 BC

**Ashini Kumar Dass & Co., 180, Lower Chitpore Road, Calcutta. Importers of Bottles phials corks capsules, etc.** 79 BC

**Krishna Silicate & Glass Works, Ltd., 17,** Radhabazar Street. Calcutta. Manufacturers of Bottles & Phials of every description. 436 BC

**Fancy White Bottles, Phials, Corks, Caps,** Etc. Enquire C. G. Depot, 18, Parsi Church Street, Calcutta-1. 90 BC

**Bimal Bottle Stores, 130, Radhabazar St.,** Calcutta. Dealers & Importers of empty Bottles, Phials, Homoeo Phials, Glasswares & Corks of all description. 71 BC

**Santosh Agency Ltd., 36, Brabourne Road, Calcutta—1.** Coloured & White Bottles, Phials, Cork Products, Capsules, Caps, Sandal Oil, Stiaric Acid, Etc., Telephone: Bank 4590 107 BC

**Radha Bazar Bottle Stores, 15, Radha Bazar** Lane, Calcutta 1. Dealers in Corks, Cork sheets, Cork Board Jointites, Cork Bungs, Granulated Corks, Cork Dust, Rubber Corks, Rubber Vaccine Caps, Alu Capsules, Lead Capsules, Paper Capsules, Bottles and Phials of all descriptions. 52 BC

# BRASS COMPONANT

**Brass, Castings, Washers, Machine Screws,** Buckles, etc. made to specification. Enquire:— Panama Industries, 4, Commercial Buildings, Calcutta 1. 38 BS

# BOOKS & PERIODICALS

**Latest Useful Books List free:—N. K. Paul** & Sons. Post Box No. 12202 Calcutta. 106 BK

**First book of its kind in India, "Business** man's Companion" by A. N. Sharma, foreward by Dr. Pattabhi Sitaramayya. An Indispesable guide & Reference book for business men and students of commerce 358 P.P. Rs. 6/8/- (Postage extra). Chaudhry Balwant Rai & Co., Booksellers, 15, Darya Ganj, Post Box. 1117, Delhi. 482 BK

# CRUDE DRUGS

**Bansidhar Dutt, 126, Khongraputty Street,** Calcutta. Botanical Crude Drugs, Spices, Gums, Waxes, Camphor, Starch, Poisons, Heavy Chemicals. 65 CD

**"For Indian and Foreign Botanical Crude** Drugs, Please contact: Shri Kalyan Pharmacy & Laboratories, Shahidganj, Saharanpur, U.P." 47 CD

**P. C. Dawn & Co., 1, Machuabazar Street, Calcutta. Botanical Crude Drugs for Allopathic. Homoeopathic, Ayurvedic & Hakimi Medicines** 68 CD

# CRUDE DRUGS

**Indian Herbs Store, 31, Mullick Street,** Calcutta-7, and S. D. Mehta & Co., Amritsar, Herb and Drugs of all kinds. 20 CD

**Supplier:—Botanical Crude drugs herbs** roots, barks, etc. A. L. Chakko, Drugs Merchant, Trichur, South India. 25 CD

**For Beeswax and all kinds of Himalaya** Crude Drugs & Herbs. Write to M/s. Danaratn & Chittaratna, Bhotahity. Kathmandu, Nepal. 390 CD

# CARBON BRUSHES

**The Calcutta Carbon-Brush Manufacturing** Co., Post Box No. 2495, Calcutta. Importers and manufacturers of Carbon-Brushes Telegrams: Calcarb. 85 CB

# CARDBOARD BOXES

**For all kinds of Card Board Boxes, Cut outs** Blocks and Colour Printings, please enquire to Mullick & Co., 82, Harrison Road, Calcutta 9 355 CB

# EDUCATIONAL & INSTRUCTIONS

**Soap, Perfumery, Etc. taught by post.** Apply for prospectus. R. Ghose B.A. (Gold Medalist. 12 Years' factory experience) 8, Kripanath Lane, Calcutta. 162 EI

**Any degree of Homoeopathic, Ayurvedic** etc., Write for Prospectus, Regal College of Physicians, 39, Neogipukur Lane, Calcutta—14 314 EI

**Government Registered Colleges Higher** diplomas in Homoeopathy & Biochemistry in easiest terms. Prospectus free from International Institute (Regd.), Telephone No. 14 Aligarh. 102 EI

# FINANCIAL

**Loans arranged on very easy Terms.** Apply sharp to: Noble Bros; Post Box No. 23, Baroda 433 FI

# FOUNTAIN PEN INK

**Gloire Fountain Pen Ink, admirably suits** all Pens for all times. Retains fluidity without sediment. Octagon Syndicate, 14, Raja Raj Ballav Street, Calcutta 3. 443 F

**Sulekha Fountain Pen Ink, in no way in**ferior to best foreign Ink, and even better than cheap imports. Contains "X-sol" a new solvent, Sulekha Works Ltd., Jadavpur, Calcutta-32. 392 F

# ICE-CREAM PAPER CUPS

**Bengal Cardboard Industries & Printers Ltd** 22-1, Gorachand Road, Calcutta-14: manufacturers of Paper Cups for Ice Cream. Hot & Cold Drinks, in all sizes. Phone:-PK. 1549. 138 I

# LABELS

**Woven Neck Labels & Transfer labels** Manufacturers. National Label Works, 11 2 Grey Street, Calcutta-5. 123 LA

# MACHINERY & HARDWARE

**Ven Trading Co., 9, Clive Row, Calcutta Dealers, stockists for both new & 2nd Hand Engines. Boilers & other Machineries. 73** MA

## MACHINERY & HARDWARE

**Genuine Typewriting parts, springs and** ...cessories. Consult R. S. Typewriter Co., 12B, ...ive Row, Calcutta 7. 78 MA

**We Manufacture Biscuit, Lozenge, Soap,** ...rley and other industrial machinery and dies. ...lgachia Engineering Works, 90, Belgachia ...ad, Calcutta 37. 2 MA

**Manufacturer of various Small Machines &** ...es. Also undertake repair. We may send our ...hanic on request. Apply Box No. 490. C/o. ...dustry Publishers, Calcutta 4. 490 MA

**Rebuilt & Secondhand Standard & Portable** ...pewriters Going Cheap. Rebuilding a Spe-...ality. Asiatic Typewriter Co., 6, Hastings St., ...lcutta. 245 MA

**Sample Cutting Machines to cut attractive** ...g-Zag samples of any Fabrics. Apply:—Navin ...andra & Co., Post Box No. 967, Bombay 1. 489 MA

**Lowest rate and guaranteed best quality** ...chines for all Cottage and Small Industries ..., Plastic, Soap, Lozenges, Hosiery, Bakery ... Immediate delivery Ex-Factory Kalna ...ading Corporation: Kalna, W. Bengal. 486 MA

**Three Roller Grinding Machine, roller size** ... long X 8" Dia. available from ready stock. ...e machine is used for grinding paints, ...inting Inks, Soap, Tooth paste, Chocolates, ... etc price Rs. 3600/- nett ex-factory. Small ...chineries Mfg. Co., 22, R. G. Kar Road, ...lcutta 4. Phone B.B. 3858. 124 MA

**Belting & Hose Pipe Interested Dealers and** ...k Consumers are requested to get in touch ... qualities and competitive rates of country ...de Hair Belting, Cotton Belting & Hose ...pes, with Messrs R. B. Banerjee & Co., ...ambar De Lane, Serampore, (Hooghly). 461 MA

**We are the Pioneer Manufacturers of all sorts** ... Industrial, Mechanical, Phermaceutical, ...weller's Machines & Tools, Pumps, M. S. Pipe ...ings of all sizes and Printing Machinery ...rts etc. etc. Write for detail to.—Industrial ...chines & Tools Manufacturing Co., ... Panchanontalla Road, Howrah. 413 MA

**We Make Machines for Making — Soap,** ...enge, Biscuit, candle, Tablet, Ointment, Nail, ..., Toys, Buckets, Tin-containers, Cardboard ...x, etc., also Printing, Book Binding, Agricul-...al, Wood Working, etc., Machines, Oriental ...chinery Supplying Agency, Ltd., P-12, Mission ...w Extension, Calcutta 1. 26 MA

**Best Machines in the Market—Build your** ...reer with industrial machines manufactured ... our factory under expert supervision. These ...clude machines for the manufacture of Soap, ...zenges, Biscuits, Chocolates, Tablets, Phar-...maceuticals, Chemicals, Paints and Pastes, ...alk Sticks, Sealing Wax, Candle Mould, En-...lopes, Plastics, etc., etc., Our machines will ...n out Standard Products and run smoothly ... long years without troubles. Small machi-...ries Manufacturing Co., 22, R. G. Kar Road, ...ambazar. Calcutta. Phone: BB 3858. 124 MA

## MEDICINES

**Asthma cure guaranteed:—Get it on your** ...st no relapse. Rs. 12-13 week. Dr. Sherman. ... Ramdhone Mitter Lane, Calcutta. 9 MD

**D. D. Eye Lotion—A Soothing Lotion for** ...ly relief of Sore-eyes, of watering discharge, ...ttiness, redness etc. of eyes. Mahatma & ..., Jorasanko, Calcutta—7. 438 MD

## MEDICINES

**"Rekoma" Cures & Prevents smokingcough** effectively. Sample against eight anna stamps. Apply: Mall-India, Bombay 19." 132 MD

**Tulsiraj Oil—Sure Cure for Hernia, Hydro-**cele, Elephantiasis, Scrofula Rheumatism. @ Rs. 3/- Kaviraj, Nagendra N. Dey 1, Bhim Ghose Bye Lane, Calcutta— 6. 170 MD

**Tiger Fat for Rheumatism, Gout, Pain** Paralysis, Re. 1-4 per tola. Lotus Honey—for eye troubles Re. 1-8 per dram. Sil & Co., 344C, Upper Chitpur Road, Beadon St., P.O. Calcutta. 404 MD

## MISCELLANEOUS

**For all Kashmir Products like almonds,** walnuts, suchhies, saffron, silk, honey etc. Please Contact Shepherds (India) Ltd., Srinagar, Kashmir 475 AD

## OPTICAL GOODS

**High Class Metal frames for Spectacles** manufactured by the Olympia Optical Factory, Bunder Road, Karachi. 129 OG

## PATENTS & TRADE MARKS

**Dutt & Co., Patent Design and Trade Mark,** Agents, Prompt and efficient services guaranteed, 82, Harrison Road, Calcutta. 70 PT

**Bibag Traders:—Patent, Design, Trade Mark** Agents and General Order Suppliers. Promt and efficient work guaranteed, 33, College Row, Calcutta 9. 488 PT

## PRINTING & STATIONERY

**St. Ford's Banking (for record), Fountink** (for Pens), Stickal (Country Gloy), Rubber Capsuled Mucilage, etc. Chemproducts Ltd., 12, Tamer Lane, Calcutta 9. 39 PS

## PAINT & COLOURS

**Chinese blue (pure), Fine blue for ink manu-**facture Laundry blue, vermilion, cloth Dyeing Compound, etc. Small Industries, Kalna. W. Bengal. 485 PC

## PHOTOGRAPHY

**For Photographic Goods at competitive** price. Please contact P. K. Bose & Co., 1, Sikdar Bagan St, Calcutta 4. 442 PY

## RADIO & ELECTRIC GOODS

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# Industry

EDITOR :
K. N. BANERJEE.

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## INDUSTRIES BOARD

THE INDUSTRIES Development and Regulation Bill which will shortly be before the Parliament draws once more public attention to the economic ills that the country is suffering from and to the measures for their quick redress.

Plans for extension of production in industrial concerns as a whole are in the air but the target of production in existing undertakings as based on their installed capacity seems to remain unrealised. The industrial development is also of haphazard character bringing in duplication of work in many cases and does not take into consideration the usual factors that go towards success of industries.

Another outstanding fact that comes to light is that the industries which are granted protection or subsidy often do not fulfil the conditions under which the protection is allowed, and thus defeats the very purpose for which the protection is offered. There should be some machinery in operation which should see that the conditions laid down are fully complied with.

It is with the object of liquidating these and similar problems that the constitution of an Industries Board having authority to exercise control over industrial matters is under contemplation. The formation of the Board as envisaged in the Industries Development and Regulation Bill aims at bringing certain important industries under the purview of the Central Government from that of the State Governments for facility of control. The Board will consist of three persons having wide experience in industrial, commercial, technical, judicial matters, or in administration. The power of granting licence of new undertakings and capital issues will also vest in the Board which may lay down conditions regarding location, minimum size, etc. of the industries for which licence for starting is issued.

Among the provisions of the Bill which have met with the sanction of the Planning Commission, special mention should be made of the following. These speak for themselves.

*(Continued on page 250)*

**THE SYMPOSIUM ON RUBBER**

A symposium on rubber was lately held at the National Chemical Laboratory of India, in Poona. Rubber manufacturers, planters, chemists and scientists, whether intimately or remotely connected with rubber industry, were among those present in the conference. It is understood that the rubber section of the Laboratory which is actually working within the High Polymer section is carrying out at the moment nothing more than theoretical work. This unfortunate state of affairs is due to the fact that the equipment of the rubber laboratory is still very far from complete. Over and above this the staff is not sufficiently large to carry out all the routine connected with more practical work. Lack of equipment is particularly felt at the moment because the NCL does not possess laboratory mixing mills: moreover rubber manufacturing equipment and apparatus for physical testing such as tensile strengths, elasticity, etc. are not yet available. Thus, the work is limited to test tubes and chemical analysis, which is quite naturally a great handicap. This is most regrettable after all the tall talks of industrial research of practical importance in National Laboratories recently constructed at huge expenses made by the Government.

While on the subject it may be pointed out that testing of rubber products in accordance with world-wide recognised standards is of first rate importance and should be started in the Laboratory. The drawing up of specifications of raw materials is of some importance. The working out of manufacturing methods and special compounds might fruitfully be included in the programme of the Rubber Section of the National Chemical Laboratory. These are problems to small manufacturers who are not equipped with the requisite knowledge and the testing laboratory where they could carry out experiments. If they could turn to the NCL, they could progress and satisfy the ever-growing requirement of the customers. Such services could be rendered against definite fees which would cover the cost and solve the financial

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*( Continued from page 249 )*

The Government can investigate certain specified industries or undertakings in industries (a) which show a fall in production, a deterioration in the quality of the product, a rise in the price of production or which show tendencies in these directions, (b) which use resources of national importance, and (c) which are managed in a manner likely to harm the interests of the share-holders or consumers, and issue proper directions for rectifying the drawbacks; and can take under its own management undertakings which fail to carry out its instructions for improvement in management and policies.

These are wide powers indeed and are likely to have a most deleterious effect on the development of the country by putting new helter round the neck of industries, if abused in any way. Yet the necessity of a measure like this for the all-round and balanced industrial development of the country cannot be ruled out. We believe there are still men of strong moral calibre and administrative foresight who can offer correct directive

roblem connected with such work. Again, great deal has been said about manufacturing all raw materials required by the ıbber industry in India. Most of the ıaterials can actually be made here ithout much difficulty and it is to be oped that the NCL should lend a helpıg hand to any-one who is interested to ıke up a particular item. Improvement in ıanufacturing methods and consequent ırger markets for finished products are lso pre-requisite.

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### IFFICULTIES OF THE SOAP INDUSTRY

The main difficulty soap industry is ıcing at present is the question of proıring adequate supplies of vegetable oils t world level prices. India which once vas the biggest producing and exporting ountry in the world in oilseeds and oil, ıas taken a secondary place and excepting rhaps in groundnut oil and castor oil ndia is far behind the other producing ountries. The production of coconut il which is considered to be the main soap ıakers' oil is estimated to be 70,000 tons ı India against the country's demand of ,80,000 tons and India has to depend ntirely on the import of 1,10,000 tons rom outside, the main supplying centres eing Ceylon, Penang, Singapore and Philippines. Government have of course realised this position as is proved by their placing the import of main vegetable oils such as coconut oil and palm oil under the O.G.L. without giving any consideration to the question of price. There is no comparison between the price we have to pay for coconut oil in India and the prices at which other importing countries are getting supplies. In the United Kingdom main oils and fats are imported on Government account and distributed amongst consumers at fixed prices. While negotiating trade agreements with producing countries they simultaneously fix the quantities to be supplied, as well as the price, whereas in our case we have been able to procure very little quantity from outside with no fixation of price. Thus crude coconut oil is available in the London market at £. 126/- (approximately Rs. 1,700) per ton, whereas the price of coconut oil in the producing centre in India is ruling in the neighbourhood of Rs. 2,400-. The question of procuring supplies of vegetable oils at reasonable prices and arranging for its equitable distribution among essential consumers must hence be given top priority by the Government without which there is little hope for the sound survival of the industries depending upon coconut oil.

It may be added that the Government of India at present levy a standard duty of 42 p. c. and a preferential duty of 30 per cent. on the import of this commodity. The main supply centre for India is Ceylon with whom our Government have entered into a trade agreement. Ceylon Government levies an export duty of Rs. 325/- per ton, while our Government collects an import duty at an advalorem basis at 30 per cent Thus more than 40 per cent. of the landed cost of coconut oil constitutes duties payable.

It may be mentioned here that the Government of India declared their policy of effecting a gradual reduction in the prices of essential goods and making available to the industry dependent on imported raw materials their requirements at as low a price as possible but when it actually comes to implementation of their intention, they only confuse the issue instead of appreciating particular aspects of any representation. It is imperative that the present high import duty on copra, coconut oil, palm oil, etc. should be removed as this is the chief factor which contributes to the high cost of imported oil. Soap makers should be enabled to get their supplies at prices

**which they can afford. It may be added that the increased cost of oil is reflected on the higher cost of production and most** of the manufacturers are working on the minimum scale to restrict their loss, there being no margin between the production cost and sale price. The result of this is more than 60 per cent. of the installed capacity is lying idle and if deterioration is to be stopped Government should adopt strong and effective measures.

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**FERTILISER FACTORY**

The Sindri Fertilizer Factory, Asia's largest fertiliser factory is expected to start working in September. Finishing touches are at present being given to the plant. Of the four main engineering sections into which the factory can be divided, three sections viz., the Power, the Gas and the Ammonium Synthesis Sections are complete; in the fourth section viz., the vital Sulphate Section all that remains to be done is some last minute cabling and instrumentation work.

Sindri has a production target of 1,000 tons of ammonium sulphate daily or about 350,000 tons a year. This annual target is expected to be reached during 1953. The present demand for artificial fertilizers in the country is in the neighbourhood of 400,000 tons annually, but it is expected to multiply fast in the next few years as the Indian farmer is gradually awakened to the advantages of modern methods in agriculture. It is estimated that Sindri's maximum capacity would meet only one-seventh of the ultimate demand between two and three million tons annually. At present there are six small plants in the country, manufacturing ammonium sulphate. Their rated capacity is 80,000 tons, but production in 1949 was only 46,000 tons.

The Sindri factory has been planned in such a way that the outturn can be doubled by the installation of additional equipment. Alternately, the factory can also be expanded to produce different types of products, such as nitric acid for India's chemical industry in general, ammonium nitrate or nitro-chalk as fertilizers, etc. In the process of manufacture of 1,000 tons of ammonium sulphate per day about 900 tons of calcium carbonate sludge will be thrown up as a by-product. Plans are under the consideration of the Government of India for utilising this by-product as a raw material for a cement factory with an installed capacity of 300 tons per day of first class Portland cement. For its working, the factory would require each day 12 million gallons of water, 600 tons of coke and 600 tons of coal. The daily consumption of gypsum, the main raw material, would be in the neighbourhood of 1,800 tons. In addition, 400 tons of other raw materials would be required daily. The power plant would have an installed capacity of 80,000 K.Ws., part of which will be "exported" to Bihar for other industrial development. The gas plant in the factory would provide 33 million cubic feet of gas each day.

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**GLASS SAND IN BUNDI**

The occurrences of glass sand have been located lately in the West and South-West of the Naini area along the G. I. P. Railway and an important deposit in the Bundi district of Rajasthan. The sand in all these areas occurs in Vindhyan quartzites which have become friable at suitable places to give rise to the deposits. The reserves near Bundi in Rajasthan have been estimated at 1,62,000 tons and those in the Naini area at 110 million tons. Both the deposits are within easy reach of the lines of communication.

Technical details of the composition of sands discovered indicate their suitability in the production of various types of glass. In the sand in Naini area the silica content varies from 90.87 to 99.04 per

ent. **The ferric oxide content is above .1 per cent. but less than 0.2 per cent.** 'he latter indicates that while the sand ıay not be quite suitable for optical and ıe best crystal glass, it is good enough for late glass, window glass, white bottles, tc. The grain size is very satisfactory. It ; also possible, that some of the best uality sands from this area may be found uitable for the manufacture of optical lass after suitable beneficiation. It is furıer noted that the sand reserves in Bundi rea are of a superior quality. The ferric xide content is less than 0.02 per cent. ·hich is within the specifications required or the manufacture of optical and best rystal glass.

**LUMINIUM INDUSTRY**

Protection to the indigenous aluminium ıdustry was granted from the 15th May 949, by means of a subsidy-cum-additionl specific duty scheme. Subsequently, ·presentations were received from the ıdustry that the rates of subsidy granted ere inadequate. The Government of ıdia did not accept this contention but asıred the industry that a review would be ndertaken by the Tariff Board after a ear's working of the scheme. Accordingy, the Board has made a review and subıitted its report confirming that there is no ıse for alteration in the rates of duties on luminium products as fixed under the pro·ction-cum-subsidy scheme of the 15th lay, 1949. Following the recommendaon the Government consider it unnecesıry to continue the additional specific duty n aluminium ingots, sheets, and circles, ıving regard to the increase in the price f imported aluminium, but consider that ıe existing protective duty of 30 per cent l valorem should be continued until the 1th May, 1952. The Indian Tariff Board ırther recommended certain safeguards ı connection with the payment of subsidy y Government to producers. The Government of India have given careful consideration to the recommendation of the Board and have decided that, as a general rule, payment of subsidy by the Government of India to a Company shall be subject to the following conditions: (a) that the Company agrees to have on its Board of Managing Directors a representative of the Government of India as one of the Directors, with the same powers, privileges and functions as any other Director on the Board and (b) that the Company agrees to furnish the Government Director with such information in regard to the working of the Company as he may, from time to time, require.

**KAPOK INDUSTRY**

Kapok is found growing wild in forests and on waste lands and river banks in most parts of India. No attempt appears to have been made to grow these trees on a plantation basis excepting by the Forests Departments in Assam, Madras and U. P. It is, therefore, difficult to estimate the total number of trees in existence or of the area covered by them in the Indian Union. However, it is clear that the quantity of kapok floss collected in the country at present forms only a small proportion of the kapok actually grown. There is also no planned collection of kapok in India. It is collected by individuals for families in very small quantities in villages and sold to local village merchants or itinerant dealers. The prices paid to the collectors by village merchants are very low and their margin of profit ranges from 20 to 50 per cent. It is further estimated that the quantity of raw floss collected in India averages about 90,000 maunds and another 70,000 maunds are obtained from the adjoining districts of Eastern Pakistan. The quantity of ginned and cleaned floss averages 60,000 maunds per annum. Of the latter, about 25,000 maunds are used for internal consumption and 35,000

maunds exported, the principal destinations being Australia and New Zealand.

Almost all the processing factories handling kapok are situated in Calcutta, which is the principal packing and exporting centre for this product. For many years Indian kapok was not considered as good as Java kapok for preparing life-saving appliances. It was only in 1919, when the Imperial Institute in London conducted certain comparative tests that it was found that Indian kapok was equal, if not superior, to Java kapok. These findings were subsequently confirmed by the experiments conducted by the Mercantile Marine Department, Calcutta, and the Marine Surveyors of the British Ministry of Transport. But Indian kapok does not even today enjoy the reputation enjoyed by Java kapok. To a certain extent the reason for this is that Indian kapok is not generally as well graded as the produce from Java, and it is sometimes adulterated with cotton waste and akund floss which makes it quite unfit for use in the manufacture of naval life-saving appliances. With a view to developing export trade and establishing a reputation for quality, it is essential that no kapok from this country should be allowed to be exported unless it is pure and graded in accordance with the standard grades prescribed under the Agricultural Grading and Marketing Act, 1937.

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**PROGRESS IN TOBACCO RESEARCH**

The nicotine sulphate which is used in the manufacture of insecticides is not now produced in India. The Council of Scientific and Industrial Research therefore intends to install a pilot plant for same. Experiments were previously made by the Indian Central Tobacco Committee to gauge the effect of farmyard manure, castor cake, and groundnut cake on the yield of bidi tobacco. On experimenting it has been found that of these organic manures, castor cake gives the best result, the yield having risen in this case by abou 50 per cent. over the unmanured fielc Viewed from the standpoint of the nitrc genous doses administered by thes manures, it is revealed that, the greater th nitrogen content of the manure, the greatc would be the yield.

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**CELLULOSE-BEARING MATERIALS**

Plants to undertake processing c cellulose pulp to make cellophane shee and rayon is now well under progress. B the cellulose pulp itself is to be importc from abroad and there is practically n factory for its manufacture in India. It learnt that a technical survey of the variou cellulose-bearing raw materials found i India and other cotton linters has feen ca ried out under the auspices of the Counc of Scientific and Industrial Research. Th pulp obtained from various types c wood, bamboos, reeds, straw and bagas and some of the fibres available in differe parts of the country have been chemicall tested as regards their suitability for u in rayon manufacture. It is encounragin to know that pulps from bamboos, reed and bagasse have been found to compa favourably with American and Swedi pulps used by the rayon industry in th countries. Both the viscose and acet methods have been applied for the purpo and the articles prepared from the shee so obtained are found to be comparable quality with those prepared from th imported pulp.

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**SUBSTITUTE FOR CEDARWOOD OIL**

Saw mills engaged in the use of Deod wood and having surplus of large quant ties of saw-dust and shavings will be inte ested to know that experiments carried ou at the Forest Research Institute, Dehr Dun, have shown that the sawdust an shavings yield by steam distillation a effective substitute for cedarwood oil whic is a valuable insectifuge and is also a con ponent of perfumes.

# —THE ART OF PYROTECHNY

'ROTECHNY is the art of making ireworks. It is said to have had its in in the East, firework displays being known in China for many centuries r to their introduction into Europe, and in this day the Chinese and Japanese l in the production of certain fireworks reat beauty.

Pyrotechny is essentially a handicraft is to say, it is one of the very few reing arts which is still carried on ded and revolutionised by the introion of modern machinery.

Not withstanding the great variety of ts produced by the many different kinds vorks, they all have certain fundamenessential in common. All fireworks ain a combustible substance, and a oorter of combustion. The combustible, ne fuel, may be either one or more of reat variety of substances, such as hur, carbon, shellac, resin, pitch, starch, ar, lycopodium, various picrates, partirly the potassium and amonium: ous sulphides, as those of iron, antiy, arsenic; various metals, as iron, oer, antimony, zinc, magnesium, and ninium.

The supporters of combustion are nly certain oxygen salts such as chlo s and nitrates, which are readily able to up their supply of oxygen to the bustible bodies. The pyrotechnist om supplies the fuel with sufficient ount of oxygen salt to bring about the plete combustion of the former. The ct of the firework maker is not to harge into the air the completely lised products of combusting, but ier to throw out a certain quantity of erial which is in a condition to enter active combination with the oxygen of air and to carry on its combustion at expense of this outside supply of gen.

The various mixtures, which are used to produce certain results have, in most cases, been arrived at, not by processes of scientific reasoning, but by purely empherical rules. Although the art of pyrotechny regarded as a chemical one, it embraces many mechanical considerations and details which are of no less importance to the production of scenic displays than those which are more distinctly chemical.

**RAW MATERIALS**

The following are some of the most important materials employed in the manufacture of pyrotechny:

SALTPETRE

Saltpetre is the most important ingredient required in the manufacture of pyrotechny. The refined variety is suitable for this purpose.

Specifications for saltpetre to be used in fireworks making call for a salt that is clean, white and should be ground fine enough to pass through a sieve of 80 to 100 mesh. It should contain less than 1% of sodium, calcium and magnesium salts combined.

POTASSIUM CHLORATE

Potassium chlorate is a very necessary chemical used in pyrotechny as a supplier of oxygen. For firework purposes it should be white, contain less than 1% of sodium, calcium and bromine combined. It should be of the same fineness as saltpetre. It produces explosive composition with sulphur. Hence great care should be taken in its use.

POTASSIUM PERCHLORATE

This substance forms another useful addition to the pyrotechnist's art. It is less liable to decomposition than chlorate. Containing even more oxygen it can be substituted for the chlorate in most mixings and can be safely used in connection with sulphur.

**Sulphur**

Sulphur is used almost exclusively in making fireworks. Specifications call, for less than 1/10 of 1% of impurities and the finely ground should pass through a sieve of 120 mesh.

Charcoal

Charcoal used in pyrotechny manufacture should be produced fresh from soft wood. Its preparation is given separately. Charcoal that has a brown tint indicates incomplete carbonization and should be avoided. Also it should contain a minimum of grit.

Steel Filings

Steel filings are used in various ways in producing scintilating effect in fireworks. The best steel filings for gerbs is known as needle steel. The steel filings from raw filing shops are quite good provided they are the result of hand filing and not the particles thrown off by emery wheels, which are useless for pyrotechnical purposes. When steel filings are added to gerb compositions, the saltpetre quickly attacks them, frequently causing the gerb to become quite hot. The steel is rusted and this action practically destroys its usefulness: To prevent this the steel must be coated in some way with paraffin that the saltpetre cannot attack it which may be accomplished as follows:—

In an agateware saucepan place a piece of paraffin and carefully melt it, heating as much as possible without permitting it to smoke. To this add clean steel filings, as much as the paraffin will thoroughly coat. There should be no surplus of paraffin but just enough to completely cover each filing. Shake the pan and stir frequently while cooling to prevent the filings from caking. Steel filings are also used for stars in rockets and shells.

Besides, the above ingredients the following materials sometimes come into the composition of important fireworks: sodium oxalate, copper sulphate, pa green, dextrin, antimony sulphuret (blacl red arsenic, picrates, aluminium a magnesium powder, etc.

Refining of Saltpetre

The saltpetre generally contains seve impurities, the most troublesome of whi are the chlorides. Since saltpetre is mair utilized in the manufacture of gun-powc and fireworks, it is absolutely necessary remove the objectionable chlorides, becau they really absorb moisture and thus sp the whole. The usual method adopted the manufacturer is stated thus:—

In an iron pan 1050 lbs. saltpetre dissolved in 600 lbs. of water at a gen heat; the solution is brought to boili heat, and another 188 lbs. of saltpetre dissolved in it. When employing the proportions with saltpetre containing ab 20 p. c. of chlorides the nitrate is dissolv completely, but the chlorides partially. T latter is fished out with a perforated ladl if calcium or magnesium salts are pres potassium carbonate is added until a fai alkaline reaction has been produced. Th hot clear liquor is diluted with 300 lbs water, a solution of 1 lb of glue dissolve in 44 lbs of hot water is stirred into it, an the whole brought to boiling again. Th glue combines with organic substance present forming scum which rises to th surface, the liquor is allowed to settle fo 24 hours in a warm place and the clea portion is run into flat copper coolers. A soon as the crystallisation begins, the liqu is constantly stirred, either by hand o better by machinery. Thus the potassium nitrate separates as minute, flowery crys tals. These are drained off and cold water is sprinkled over them to remove all adhering mother liquor. This is usually done in vessels provided with a perforated false bottom, covered with linen. Finally the flowery particles are dissolved in a small quantity of hot water and then set aside to

als of saltpetre begin to appear. It is a aluable fertiliser.

### PREPARATION OF WOOD CHARCOAL

As charcoal is the only product in view. ne carbonization of wood may be done in its or kilns and the volatile products go o waste. For this purpose the wood is eaped in a hemispherical pile around a entral opening, and covered with earth nd sod, leaving only a few small draught oles near the bottom. Then it is ignited t the centre and allowed to burn until the whole pile is on fire. A smouldering comustion takes place, largely at the expense f the oxygen and hydrogen of the wood bre, forming water, carbon dioxide, and olatile hydro carbons, which escape, the raught holes are then all closed and the eat is kept carefully covered until the fire mothers and the charcoal is cold.

### FORMERS

All paper cases are rolled on formers f one kind or another. For rockets these ay consist of hard wood sticks but better ormers are made of light brass tubing with n outside diameter equal to the inside iameter of the case desired. They should e one to two inches longer than the intended case and fitted with wooden handles to nable them to be easily removed when ase is rolled.

Mines are rolled on wooden formers, ne ends of which are turned down to convenient size to fit the hand. Roman candles re rolled on rods of machine steel while atch pipes and pin wheels are rolled on in brass or steel rods. Lances are rolled n small brass tubing.

### PASTE

Paste most suitable for Fireworks ay be made as follows:—

Mix 4 oz. of wheat flour with 8 oz. of water and 1/8 oz. powdered alum, rubbing ntil free of lumps. Pour this slowly with constant stirring into 16 oz. of boiling water to which has been added 5 drops of carbolic acid, 5 drops of oil of cloves and 2 grains of corrosive sublimate. When cold it should be ready for use.

### MEAL POWDER

Mount a 50 gallon wooden barrel on two uprights so that it will revolve freely on centres fastened to the heads. On one centre attach a crank and cut a hole (close by a suitable plug) into side of barrel for putting in and removing the necessary ingredients. Place in the barrel 300 to 500 lead shots or balls about one inch in diameter. When it is desired to make meal powder, put into the barrel a thoroughly mixed composition as follows:—

| | | |
|---|---|---|
| Saltpetre | 15 | lbs. |
| Charcoal | 3 | ,, |
| Sulphur, flour | 2 | ,, |

Put the ingredients into the barrel and revolve it for about 500 turns, when the mixing may be complete. But more revolutions of the barrel may produce stronger powder. Great care must be exercised to see that no foreign matter such as nails, gravel, etc., find their way into the barrel as this might result in an explosion.

### STAGES OF MANUFACTURE

For convenience the manufacture of pyrotechny may be divided into three stages.—

1. Preparation of mixtures.
2. Manufacture of cases.
3. Loading the cases.

### PREPARATION OF MIXTURES

The mixtures used in fireworks are called compositions or fuses, and their preparation requires some care. In order to obtain good results out of the materials and also to avoid accident in handling explosive substances, a knowledge of chemistry is indispensible. Many mixtures also are liable to undergo chemical decomposition so that they can only be employed. When the firework is to be used within a

short time of its manufacture; other mixtures are liable to more rapid spontaneous decomposition resulting in the ignition and explosion of the materials.

Mixing is, therefore, considered the most important operation in fireworks.

In mixing on a small scale, round brass wire sieves are the best. For lances and the more particular work 22 to 26 mesh may be used while for plain making 16 to 18 mesh is suitable. If 25 lbs. or more of composition is to be mixed ordinary painted wash tubs are most convenient and the sieves should be made so as to just fit inside the upper edge of same while for mixings of from 100 lbs. up troughs are often used. For these, the sieves are made square and fit just inside the troughs, same as with tubs. Mixing machines are sometimes used for bright work or mixings containing no chlorate of potash but they are too dangerous for colours.

With the plain mixings, the coal is weighed first and put into the bottom of the tub; then the sieve put in place and the sulphur, saltpetre etc. pushed through it. When everything is sifted, bare the arms and mix well in every direction. Place the sieve on another tub of same size and sift from the first tub into the second one, a scoopful at a time. When all has passed through for the second time repeat once more into the first tub, mixing between siftings and after last sifting. For ordinary compositions this is sufficient but some mixtures are passed four or five times through the sieves.

In coloured mixings more care must be observed and each ingredient sifted separately the first time, except the shellac, coal, etc. which can be put right into the bottom of the tub. Never throw the chlorate of potash on the sieve at the same time with dextrine or other hydrocarbons but sift the potash first and add other salts one by one. Great care should be taken never to let the fingernails strike the sieve while sifting as it is very easy to "strike fire" from such causes, with disastrous effect as sharp star compositions in a loose state are almost as explosive as meal powder. Special mixings will be described when we come to the compositions requiring them.

### MANUFACTURE OF CASES

All kinds of fireworks require a case of some kind. A good case must be tightly rolled and almost as hard as iron. The best arrangement for case rolling is a sort of large desk made of tongue and grooved flooring tightly joined and firmly nailed to sills of about 2 inches thickness and tapering from 2 inches in front to 6 or 7 inches in the back so as to from a gentle rise from front to rear. According to the work to be done the rolling board may be made from two to four feet wide.

Most cases are rolled from strawboard. For rockets two or three turns of cartridge paper are used first, backed up by five or six turns of strawboard. The cartridge paper being waterproof swells and contracts but little in rolling while the strawboard, being absorbent swells considerably; therefore when the strawboard is rolled on the outside of the case, it contracts in drying and is shrunk on making a very firm case. The recently produced kraft paper makes an excellent case.

Owing to the great variety in size required, the cases are all made by hand. The tools employed are of the very simplest description, consisting of a wooden or metal roller called the "former" and a sort of wooden board with a handle on one side, known as the "rolling board." For the larger cases the paper is pasted over its whole surface, and rolled round the former, the operation being done on a narrow slate table. The rolling board is then passed rapidly over it a few times with a firm steady pressure. The former

then withdrawn, and the case stood on d until it is so far dry that it can be laid its side without risk of its losing its lindrical shape. It is then stacked in a ı in a chamber through which a current hot air is circulating, in order to render perfectly dry. In many fireworks the ses have to be partially closed, or con-icted near to one end. This is techni-lly known as "choking." It may be ected in two ways, either by compress-g the walls of the case to the desired tent, or by partially filling the mouth of e case with clay. When the first of these ans is adopted, the operation is perform-d when the case is freshly made, and nly partially dry. For small fireworks it done by means of a hand lever made of wo blades of steel, and screwed to the dge of the table. For larger cases a foot ver is employed.

When the construction is effected by neans of a clay plug, the operation is per-ormed at the time of loading.

For small cases the paper is pasted only along the edges, the former, in this case a thick metal wire, is placed nearly in the middle of the paper. One end is then folded over nearly to the other, and the double paper rolled over the former.

The cases may be closed at one end by folding the paper in upon the end of the former. These cases require no special drying chamber.

Besides cylindrical cases, there are cases made in the form of a sphere, known as "shells." These shells, which are cons-tructed of various sizes, upto even 24 inches in diameter, are made by a process technically known as the "wetbroke" process. Brown paper of a specially good quality is thoroughly pasted on both sides; strips are then torn from the pasted length, and laid upon the inside of a hemi-spherical bowl or mould, the strips radiat-ing upwards from the centre to the cir-cumference; the ends lapping over the edge of the mould: the workman continues this process until the desired thickness of paper is obtained. It is then removed from the mould and allowed to dry. These hemispheres are then placed in a lathe, and the rugged lips or rims carefully turn-ed off. Two of these hemispheres are securely glued together to form the com-plete shell. These shells are destined to carry coloured stars and to be fired from a mortar; the mould in which they are made has therefore a slightly raised ridge running part of the way down. From the circumference, and producing a corres-ponding indentation or "dimple" in the shell, which allows of room between the shell and the side of the mortar for com-municating the fire to the propelling charge below.

**LOADING OF CASES**

The loading operation varies in details according to the type of firework to be filled, but it may be divided into two parts, viz. loose filling and ramming. The appa-ratus employed in the first of these methods is a metal funnel of an elongated shape, and a wire, the operation being known as "wire and funnel" filling. The wire is usually square, and of such a thickness that it will just pass through the end of the funnel. The case to be filled, if a choked case, is placed upon a stand with its choked end fitted upon a nipple fixed for its reception; the stem of the funnel is then inserted into the open end of the case, and by drawing the wire quickly up and down the composition is pushed down uniformly into the case. When full to the required height the case is closed up. With small fireworks (such as squibs, etc.) this is done by firmly squeezing the end of the case with a tool known as the "closing in" machine, and finally dipping the end into a composition made up of glue and red lead commonly called "dip."

Long narrow cases are filled without e use of a stand. For wheels no special ols are required, the long narrow tube ing wound by hand upon a small wooden sc, and secured by strips of tape or paper ued across. In the manufacture of crack- s two special pieces of apparatus are quired. The first is a rolling or flatten- g machine. The filled cases are passed tween the rollers of this tool, and ereby squeezed flat, the pressure being refully regulated to the required degree. ie other tool is the bending machine. ie cans are bent backward and forward er steel wires about the thickness of a ut steel knitting-needle, until the re- isite number of bends is obtained; they : then pressed firmly down with a piece wood, and removed from the machine. e bent case are then tied up into the niliar compact form with a suitable ead, and the ends primed in the usual y with touch-paper.

Of the second method of loading cases composition is rammed in, viz. the man candle, in which the mixture is itly rammed, and the rocket, in which s malleted. The case of a Roman candle straight or unchoked one. It is placed on a block and the projecting core ex- ly fits into the case.

A small quantity of of finely-powder- and sifted clay is first introduced, and itly driven down by means of the ram- , a wooden rod which loosely fits in the e. By pressure the clay sets to a still d mass. The case is next to be filled 1 the composition, and coloured stars, rnating. Each layer of mixture is intro- ed in two quantities, and rammed m. Care is taken to regulate the charge nixture, so that each star shall be blown to the same distance.

Rockets are loaded by the mixture ig forcibly rammed into the case by a let, and as this firework is in some res- s of a special construction a brief description is given at the proper place to make it understandable.

### ROCKETS

Rockets are perhaps the most popular article of the pyrotechnical craft. So much has been written about sky rockets that any general description would be superfluous. Suffice to say that rocket con- sists of a tube of paper, rammed with suitable composition, its lower end choked to about ⅓ rd. the diameter of its bore and a hollow centre extending upward through the composition to about ¾ inch of the top. A stick is attached to the tube serving to balance it while ascending.

Rockets are fitted with cap containing the garniture of the rocket which may take the form of stars or other pyrotechnic effects, or a gun-cotton wad, or similar explosive to make a sound signal, or small cases, charged with picrate of potash, producing the well-known whistling rocket effect.

The cap is either cylindrical or in the form of a truncated cone, with a coni- cal or other top. The cap is burst open and the contents ignited by an opening charge of powder lighted through a hole bored in the clay diaphragm above the heading, so that when the heading is burnt through the fire may be communicated to opening charge.

The body of the rocket is of paper tube constricted at the lower end either by squeezing and then tying with a ligature, or by means of a clay plug.

### COMPOSITION

The following are good compositions for rockets of different sizes:—

| | 1 to 3 oz. | 4 to 8 oz. | 1 to 3 lbs. | 4 to 8 lbs. |
|---|---|---|---|---|
| Saltpetre | 18 | 16 | 16 | 18 |
| Mixed coal | 10 | 9 | 12 | 12 |
| Sulphur | 3 | 4 | 3 | 3 |

If on trial rockets burst add more coal f they ascend too slowly add more ;altpetre.

In order to fill the body a conical mould s inserted through the constricted end. oint upwards, and the propellant charge hen added little by little and well malleted ıome. Considerable skill is required n doing this as the packing must be ʝuite even if good results are to be obtain- ·d. When the propellant has been added he top is closed with a perforated clay ılug through which a piece of quick match ıouch paper) passes in order to fire the ead, and conical mould then withdrawn. 'he head is another paper case containing burster charge of gun powder and garni- ure in the form of stars, floating stars, or ·histling fireworks, and is glued on to the ody. The stick is then attached so that ıe rocket balances when supported about ne inch from the base. It is fired by ap- lying fire to the conical hole left in the .ase by the mould. The outrush of gases ıuses the rocket to ascend, and when at s maximum height the quick match causes ıe burster charge to explode, thus liberat- ıg the garniture.

#### TOUCH PAPERS

Touch paper is much used for igniting reworks, and is made by brushing paper. ·ually blue in colour, or one side with a ,lution of nitre (half a pound to the gallon) ıd then drying. Slow match for pyrotech- ıc purposes is made by soaking blotting aper in lead nitrate solution (2½ lbs. per .lon) and, after drying, pasting the sheets ·gether, usually so as to give six thickness- · Pyrotechnic quick match, on the other ·nd, is made by impregnating lamp wick ·ton with a smooth cream of hot starch ·lution and meal powder, and then dusting ·ver with dry powder.

#### STARS

Stars are very similar in nature, but are ·ntained in a rocket or shell, and only liberated and ignited when the rocket or shell has reached its maximum height. They consist of fiercely burning mixture containing chemicals to impart colour to the flame. We now show how stars are made.

These require considerable care in preparations success depending upon the uniform fineness, the intimate union, and the dryness of the ingredients.

There are two types of stars, namely "naked" and "pill box' stars. The former is composed of a mixture of charcoal, sul- phur, meal powder, and nitrate of a metal to impart the desired colour, the ingredients being mixed together with shellac, and then either moulded into pellets or spread out can cut up into cubes, after which the solvent is dried off and the stars loaded direct into the rocket. These stars should only be employed in fireworks of the small- est sizes, as they are very apt to crumble. In any case to avoid crumbling it is very important to use shellac or other binding material which is completely soluble in the solvent used, usually methylated spirit. As a rule no special device is used for ignit- ing naked stars, ignition being brought about by the burster charge and for this reason they are almost invariably composed of nitrate mixture and not chlorate mixture. In any case a naked chlorate star in contact with meal powder cannot be used as it would mean having a chlorate in contact with sulphur.

Coloured rocket stars are also made by driving the coloured composition, slightly moistened with gum water into small cases which go under the name of pill-box cases. These are known as pill-box stars and are much safer than naked star. If the star is to consist of one colour only, these pill- boxes are open at both ends, and a piece of quick match is placed between the com- position and the inside of the pill-box and allowed to project about half an inch be- yond each part of it. When fired these

urs burn at both ends at the same time, nd so produce a great amount to smoke in proportion to their size.

If it is required to make stars consisting of more than one colour, the pill-boxes are left open at one end only. The composition is thus prevented from burning at more than one of its surfaces at a time. These stars generally contain two colours: the pill-boxes are half-filled with one-coloured composition and the remaining space is filled with the other composition.

RED

| | | |
|---|---|---|
| Potassium chlorate | 47 | parts. |
| Sugar | 21 | .. |
| Strontium carbonate | 22 | .. |

BLUE

| | | |
|---|---|---|
| Potassium chlorate | 80 | parts. |
| Sugar | 50 | .. |
| Cuprous sulphide | 30 | .. |
| Mercurious chloride | 40 | .. |

GREEN

| | | |
|---|---|---|
| Potassium chlorate | 13 | parts. |
| Sugar | 11 | .. |
| Barium nitrate | 15 | .. |
| Mercurious chloride | 11 | .. |

YELLOW

| | | |
|---|---|---|
| Potassium chlorate | 59 | parts. |
| Sodium oxalate | 17 | .. |
| Shellac | 24 | .. |

Magnesium or aluminium powder is also sometimes added in the above in order to increase the brilliancy.

**WHISTLING FIREWORKS**

The peculiar property of potassium picrate to whistle while burning has been known for a long time and has been made use of for producing the amusing whistling fireworks. To make this article dissolve 1 lb. picric acid in the least possible quantity of boiling water, in a porcelain receptacle; add ½ lb. potassium carbonate, little by little, stirring continuously. Then add 1 lb. powdered saltpetre. Stir thoroughly, allow to stand for one hour and remove to a heavy piece of filter paper placed in a glass funnel where it can drain. When dry crush to fine powder with a wooden roller. Very small quantities should be handled at a time as an explosion will cause disastrous results. The dry powder may be rammed into tubes from ¼" to ¾" diameter and will produce the whistling sound when burned. Bamboo tubes are most effective.

Owing to the ease with which potassium picrate detonates whistles cannot be used in shells but small tubes ¼" diameter and 2½" long when charged with the above composition may be placed in the heads of rockets or fastened to the outside and arranged to burn as the rocket is ascending. Attached to wheels they are quite amusing, but the most effective use for them is when a series of six or eight ranging in size from ¼" to ¾" diameter are set side like a Pandaen Pipe and burned simultaneously.

**ROMAN CANDLES**

Roman candles are probably the most popular piece of fireworks made. On a small scale they are made entirely by hand that is, one at a time. To make these by hand roll the cases and have a lot of stars of different colours ready. Then made some candle composition as follows:—

| | | |
|---|---|---|
| Powdered saltpetre | 18 | parts. |
| Finely powdered charcoal | 11 | .. |
| Flours of sulphur | 6 | .. |
| Dextrine | 1 | part. |
| Water | 1 | .. or more |

Mix all the solid ingredients well and sift three times. Then add the water and mix again until the whole lot is evenly dampened. Then force through a 16 mesh sieve into cloth bottomed trays and dry in the sun.

Now provide a ramming outfit consisting of a pin block, a rammer, a composition scoop, a clay scoop and a gun powder scoop.

Now place an empty can on the pin, ɔur in a scoop of clay and ram it firmly ith a light mallet. Remove rammer, pour ı a scoop of gun powder on top of which rop a star and lastly, a scoop of candle ›mposition. Ram with about six blows f a light mallet. Remove rammer and our in another scoop of gun powder, anther star and another scoop of candle omposition, repeating this until case is ılled to within 2 inches of the top. Reıove candle and finish described under.

If the composition becomes so dry that will not pack fienly it should be dampend with a very little water. The stars hould be hard and dry and free from star lust which can be sifted out by shaking tars in a coarse sieve. The floor of ramıing room also should be kept free from ll accumulated composition to guard gainst accidents from friction of the shoes r otherwise.

### LANCES

These are small paper tubes from ¼" o ⅜" diameter 2" to 3½" long filled with omposition burning different colours with ı duration of one minute and used for roducing the different designs used in ireworks exhibitions, such as portraits, nottes, etc. The cases are rolled and ammed with funnel and rod, as previousv described.

Some lance compositions are so light is to be difficult to ram. These should be lightly dampened first. Blue lances made with paris green and white ones using ealgar are frequently used without priming as they ignite very easily.

A good lance should burn clear for one minute, without flaring or clogging up. All colours should burn off about the same duration. If a lance burns to one side it is often because the composition is not well mixed or because th ere is more paper on one side than on the other. They should have about three turns of paper all around.

### LANCE COMPOSITIONS

| | Parts | Parts |
|---|---|---|
| Potassium chlorate | 16 | 16 |
| Strontium nitrate | 3 | — |
| Strontium carbonate | — | 3 |
| Shellac | 3 | 2 |
| Lampblack | ⅛ | ¼ |

GREEN LANCES

| | Parts. | Parts. | Parts. |
|---|---|---|---|
| Potassium chlorate | 7 | 16 | — |
| Barium nitrate | 7 | 4 | 4 |
| Barium chlorate | — | — | 5 |
| Shellac | 2 | 4 | 1 |
| Calomel | — | 3 | 2 |
| Lampblack | — | ⅛ | — |
| Picric acid | — | 1 | — |

WHITE LANCES

| | Parts. | Parts. | Parts. | Parts. |
|---|---|---|---|---|
| Saltpetre | 9 | 14 | 5 | 8 |
| Sulphur | 1 | 4 | 2 | 2 |
| Antimony sulphide | 2 | — | — | — |
| Antimony metalic | — | 3 | 1 | — |
| Meal powder | — | — | 1 | — |
| Red arsenic | — | — | — | 1 |

BLUE LANCES

| | Parts. | Parts. | Parts. | Parts. |
|---|---|---|---|---|
| Potassium chlorate | 20 | 16 | 12 | — |
| Potassium perchlorate | — | — | — | 24 |
| Paris green | — | 5 | — | — |
| Copper sulphate | 6 | — | — | — |
| Copper ammonium sulphate | — | — | 3 | — |
| Copper ammonium chloride | — | — | — | 6 |
| Shellac | 4 | — | 1 | — |
| Stearine | — | 1½ | ¼ | 2 |
| Dextrine | 1 | — | — | — |
| Calomel | 4 | 3 | 3 | — |

YELLOW LANCES

| | Parts | Parts. | Parts. |
|---|---|---|---|
| Potassium chlorate | 16 | 4 | 4 |
| Sodium oxalate | 2 | 2 | 2 |
| Shellac | 3 | 1 | 1 |
| Charcoal | ½ | — | — |
| Barium nitrate | — | — | 1 |

### TUBRI OR GERBES

Tubri or Gerbe is one of the most popular fireworks. It consists of casing of

mould of burnt clay. The case has two openings. One wide about 1 inch at the bottom and the other narrow like a pencil at the top. The former assists in filling up the mould with the composition while the other for kindling. When kindled a brilliant shower of sparks like that of a fountain emerges out with a great force and reaches a considerable height emitting dazzling light.

There are several varieties of gerbes and are named according to the nature of their displays.

A few typical recipes follow:—

I

| | | |
|---|---|---|
| Nitre | 10 | parts. |
| Sulphur | 2½ | ,, |
| Charcoal | 2 | ,, |
| Cast iron filings | 6 | ,, |

II

| | | |
|---|---|---|
| Best crystals of potassium nitrate | 26 | parts. |
| Roll sulphur | 10 | ,, |
| Light and fresh charcoal | 3 | ,, |
| Fresh cast iron filings | 19 | ,, |

Expose the ingredients in the sun to dry, then grind the first three substances separately in a mortar and pass through fine cloth. Weigh and mix. Now take the iron fillings free from rust and of the size of poppy seed—but the size may vary according to the shape and size of the mould used. Mix the whole and load the clay mould carefully through the bigger opening and press tightly, which is then plugged with hard mud. The smaller opening is then pasted on with paper which is ignited on firing.

CHANDRA MALLIKA

| | | |
|---|---|---|
| Nitre | 10 | parts. |
| Cast iron filings | 4 | ,, |
| Sulphur | 2 | ,, |
| Charcoal | 1¼ | ,, |

Expose the ingredients in the sun to iron filings separately in a mortar and pa[ss] through fine cloth. Weigh and mix. No[w] take the iron filings free from rust and [of] the size of poppy seed—but the size ma[y] vary according to the shape and size [of] the mould used. Mix the whole and lo[ad] the clay mould carefully through the bigg[er] opening and press tightly, which is th[en] plugged with hard mud. The small[er] opening is then pasted on with paper whi[ch] is ignited on firing.

HAZARI

| | | |
|---|---|---|
| Nitre | 16 | parts. |
| Cast iron filings | 8 | ,, |
| Sulphur | 3 | ,, |
| Charcoal | 3 | ,, |

Proceed as above.

JASMINE

| | | |
|---|---|---|
| Nitre | 80 | parts. |
| Sulphur | 5 | ,, |
| Charcoal | 6 | ,, |
| Cast iron filings | 10 | ,, |

ROSE BUD

| | | |
|---|---|---|
| Meal powder | 6 | parts. |
| Saltpetre | 2 | ,, |
| Sulphur | 1 | part. |
| Charcoal | 1 | ,, |
| Steel filings | 1 | ,, |

FLOWER POTS

| | | |
|---|---|---|
| Saltpetre | 10 | parts. |
| Sulphur | 6 | ,, |
| Lampblack | 3 | ,, |
| Steel filings | 6 | ,, |

**ELECTRIC TUBRI**

In preparing this sort of gerbe the ingredients are generally of a quite different category. Instead of nitre, charcoal and sulphur which are used in making ordinary gerbes, use is made in this case simply of shellac of fine grade and chlorate of potash. For attaining success in manufacture it is desirable that the shellac should be reduced to powder and finally passed

ash is also sifted through a fine cloth. cautions should however be taken that ingredients do not come in contact h other substances particularly sulphur, erwise due to explosion dangerous conuences may follow.

A couple of typical recipes follow:—

I

| | | |
|---|---|---|
| Chlorate of potash | 16 | parts. |
| Shellac | 6 | „ |
| Magnesium | 8 | „ |

II

| | | |
|---|---|---|
| Chlorate of potash | 16 | parts. |
| Shellac | 4 | „ |
| Aluminium | 10 | „ |

**FLYING TUBRI**

This should be prepared as fresh as ssible. Otherwise, sugar being in cont with chlorate of potash for a good gth of time is liable to get oxidised with result that the Tubri is likely to burst 1 may not ascend to a great height. ind each ingredients separately and sift ough a fine cloth and then weigh out 1 mix.

ORDINARY

| | | |
|---|---|---|
| Chlorate of potash | 10 | parts. |
| Refined sugar | 4 | „ |

RED

| | | |
|---|---|---|
| Chlorate of potash | 10 | parts. |
| Refined sugar | 4 | „ |
| Strontium nitrate | 1 | part. |

BLUE

| | | |
|---|---|---|
| Chlorate of potash | 10 | parts. |
| Refined sugar | 4 | „ |
| Copper sulphate | 1 | part. |

GREEN

| | | |
|---|---|---|
| Chlorate of potash | 10 | parts. |
| Refined sugar | 4 | „ |
| Barium nitrate | 1 | part. |

YELLOW

| | | |
|---|---|---|
| Chlorate of potash | 10 | parts. |
| Refined sugar | 4 | „ |
| Soda | 1 | part. |

The ingredients are powdered separately, sifted, mixed thoroughly and then charged into tiny clay moulds.

**SPARKLERS**

The growing popularity of sparklers from day to day makes one think abuot its manufacture. But like other articles of commerce the details of this manufacture are not available. The following general process will serve the purpose with a little modification.

| | | |
|---|---|---|
| Powdered charcoal | 25 | parts. |
| Steel filings | 30 | „ |
| Aluminium powder | 15 | „ |
| Gum arabic | 6 | „ |
| Saltpetre | 5 | „ |
| Sulphur | 2 | „ |

First of all work up the gum with water into the consistency of mucilage, the other items except the steel filings are stirred in. The steel filings lightly coated with paraffin is finally added.

Then work the mixture up to the consistency of porridge.

**ELECTRIC SPARKLERS**

The principal stick consiists of wire or thin twisted metal, part of which is covered with a composition containing steel filings.

| | | |
|---|---|---|
| Fine steel filings | 12 | parts. |
| Fine aluminium powder | 1 | part. |
| Potassium perchlorate | 6 | parts. |
| Dextrin or gum arabic | 2 | „ |
| Water | | q. s. |

The steel must be protected from corosion with a little paraffin. The gum should be made of the consistence of mucilage. Mix the ingredients thoroughly and add gum solution until a mixture is obtained that will adhere to the wires when they are dipped into it.

This varies in different sections and with different runs of ingredients. In practice, bunches of wires are dipped at once and slowly withdrawn in a current of warm, dry air which causes the mixture to adhere evenly.

A sparkler of great brilliance and which are every effective may be made as follows:—

| | | |
|---|---|---|
| Dextrin | 3 | lbs. |
| Water | 12 | pints. |
| Potassium perchlorate | 10 | lbs. |
| Aluminium powder (fine) | 7 | ,, |

Take the dextrin add the same, little at a time to the whole water stirring continually so as to avoid lumps. Mix intimately the potassium perchlorate with finely powdered aluminium and add this to the gum solution, stirring until a perfectly smooth mixture is obtained. Wire of required size and thickness may now be dipped into it to the desired depth while it is contained in a deep vessel, and placed in a suitable rack for drying. It may be necessary to dip the sticks several times dependent on how much composition it is desired to have on them. In this case they should be dried with the composition end up, the first time so that much composition accumulates on the end beyond the stick.

### POT-POTIA

This is a very amusing piece of firework. When scratched on the pavement it gives off a continuous series of little explosions.

Mix 5 kilograms of powdered gum arabic with 5 litres of water, adding water gradually with constant stirring. Then add 1½ kilograms of magnesium carbonate. Place this on a water bath with a thermometer arranged so that the temperature can be carefully observed and heat to 50°C after which add a mixture of 1 kilogram of white phosphorus and stir until entirely melted. Continue stirring while cooling to 25°C after which add a mixture of 2½ kilograms red ochre and 3 kilograms potassium chlorate and stir cautiously until a perfectly smooth product results after which it may be poured in paper moulds in the manner described below.

Secure a number of boards of ⅞" material and bore holes into them ¼" deep and 1¼" diameter. Turn up a puncher which will work easily in the holes. Cut some red tissue paper of good quality into circular pieces 2½" diameter. Lay them over the holes in board and punch in. Pour into those the composition and fold over the edges of the paper. Allow to set and when hardened they may be removed and thoroughly dried when they will be ready for use. In preparing this firework great care must be used to prevent accidents as the mixture containing phosphorus and potassium chlorate are liable to ignite on rough handling.

### COLOURED FIRE STICKS

These consist of thin wooden sticks similar to applicators used by physicians applying iodine etc. to affected parts. They are dipped for half their length into coloured fire composition in a more or less liquid state.

One method is to melt one part of gum shellac in an iron pot. Stir in five parts of very finely powdered strontium nitrate. To keep this sufficiently liquid it must be kept quite hot by the use of a steam kettle. This is for red sticks. Another method is to dissolve the shellac in alcohol and adding the strontium. The proper consistency of the mixture can be easily regulated by using more or less alcohol as required. When the sticks are dried they are ready for use.

Green is not so successfully made, barium nitrate being substituted for strontium. A little lampblack improves the burning but detracts from the colour, especially the green. The sticks are pushed into a groove in the bar.

### RUBY AND EMERALD SHOWER STICKS

These are much more effective and are made in the same manner as above, using following composition: —

| | | |
|---|---|---|
| **Strontium nitrate** | **6** | **parts.** |
| **Coarse aluminium powder** | **6** | **„** |
| **Potash perchlorate** | **2** | **„** |
| **Shellac** | **1** | **part.** |
| **Alcohol** | **q. s.** | |

Dissolve shellac in alcohol and add ıer ingredients, previously well mixed. r thoroughly to consistency of thick glue d dip sticks previously arranged in holder that they may be placed in drying rack.

For green use:—

| | | |
|---|---|---|
| Aluminium powder coarse | 6 | parts. |
| Barium chlorate | 4 | „ |
| Shellac | ½ | part. |
| Alcohol | q. s. | |

The Japanese make a similar article of isted paper but this requires a great deal practice to learn.

### CHINESE CRACKERS

Chinese crackers are the interesting tle articles of pyrotechnics. These are epared as follows:—

The tubes or cases of these fire-works e 1¼" long, ¼" outside diameter and have bore of 5/32". They are rolled of a soft coarse blotting paper. A small amount gum water is used as a binder and the se is finished with one turn of very thin d, green, or yellow paper. They are lled in lengths of one to two feet and en cut to the required size.

Now a block is prepared for gathering bout 1000 of these tubes. For this purse a piece of hard wood about 1" thick ıd cut into a hexagon is provided with inted wood or metal pins set into the ood base so that the above amount projected exactly ¼" apart. A tube is now ipped over each pin until the entire block filled. A piece of white paper is now sted over the top of the bundle. When y it is removed from the form and a ece of paper pasted on the otherside when is dried again. The under side is oistened at the edges and the surplus aper neatly rubbed off. When again dry the upper side is moistened all over and the paper over the top of each cracker is pierced with a punch or round pointed stick so that they may be charged with the necessary powder and clay. Some operators hold several sticks between their fingers at one time so as to be able to punch several holes simultaneously.

A wooden board about one inch wider all around than the bundle of crackers and ¼" thick with ⅛" holes bored through it, corresponding exactly in position with the crackers in the bundle, is now laid on a smooth board, covered with finely powdered clay which is pressed into the holes in it, with the hand, until it is firm enogh not to fall out when the piece is lifted. The surplus is brushed off and it is placed over the bundle of crackers so that the clay filled holes are exactly over the openings in the tubes. A slight blow is usually sufficient to cause the clay to fall into the crackers. Any not falling out is pushed out with a stick. The bundle is jarred slightly against the table to make the clay settle. A similar operation is now performed with a thicker board containing slightly larger holes containing the powder charge after which the clay board is used once more as described above.

The top layer of paper is now moistened so that it may be entirely removed and the clay which has become slightly moistened as well, is gently pushed down with a suitable rammer. It is then dried in the sun. The bottom end is now carefully dipped into water, turned bottom up and the paper removed from this side also, the clay pushed down and pierced with an awl for the purpose of *inserting the match* of fuse. This is however not done until the crackers have been again dried in the sun. After the fuses are inserted the ends of the crackers are pinched around it, about ⅛" from the end, by a crimper or two blunt knives hinged together at one end and having a V. shaped notch cut out of the

centre of each blade, so that when two notches approach from opposite sides they pinch the cracker together and cause the fuse to be held in place. When they are now finally dried for the last time they are platted together so as to form the packs of commerce. The platting and wrapping of the packs is such a dextrous performance that it is useless to try to describe it as it is only acquired by many years of succeeding generations doing the same thing.

The following formulas are in use for making the composition used in Chinese crackers and flash crackers:

**CHINESE FIRE CRACKERS**

| | Parts. | Parts. |
|---|---|---|
| Saltpetre | 50 | 45 |
| Sulphur | 25 | 18 |
| Charcoal | 25 | 25 |
| Chlorate of potash | — | 8 |
| Sand | — | 4 |

**MAGIC SERPENT**

This remarkable substance consists of small pellets of sulphocyanide of mercury which has the remarkable property of swelling 25 to 50 times its original size when lighted, producing a long snake like ash. To prepare, make a concentrated solution of mercuric chloride and add little by little a solution of potassium sulphocyanide, stirring constantly. A greyish precipitate will be formed and when the last drop of sulphocyanide added no longer produces cloudiness permit the mixture to settle. Drain off as much as possible of the clear supernatant liquid, remove precipitate to a paper filter placed in a glass funnel and wash slightly. When thoroughly dry reduce to a fine powder. Now moisten very sparingly with a weak solution of gum arabic to which may be added a pinch of saltpetre and form into cones.

**PYROTECHNIC MATCHES**

Pyrotechnic matches are otherwise known as Bengal lights. They are made burning. Green and crimson lights are th most common and favourite. During Ka Puja and Dewali festival, these coloure matches are extensively fired by th children in almost all parts of India an they form safe and pleasing fireworks fo them. Although the demand lasts for few days only, the consumption of same considerably big.

The manufacture of pyrotechn matches thus strictly forms a part of th fire-works industry. But it is allied ve closely to match making in every particul of its manufacture. The box making pro cess is identical with that of safety matche The bottoms of the inner boxes, howeve are made thicker than those of safet matches.

**SPLINTS**

Splints used for the manufacture o pyrotechnic matches are made broader an flatter, and not square as those of safet matches. But they are equal in length a thickness to ordinary match splints. Th flat sides of the splints permit of holdi more composition and spreading of sam on the flat sides to give a bigger flame a the expense of the minimum quantity o wood. The flat splints are manufacture by increasing the feed of the pile of veneer in the splint chopping machine on inte changing the ratchet wheel and varyin the number of steps turned by the ratchet

Paraffining is not required in the manu facture of pyrotechnic matches. The ap plication of the composition requires two separate dips in two different compositions the first being allowed to dry up thoroughly before the next one is applied.

The composition for the first dip is for producing the coloured light while that for the second dip is for the match head to fire the former. The coloured-light composition is applied about two-thirds of the length of the splint and the match head

or producing the green colour consist of he salts of barium while those used for he red colour are compounds of strontium. They are mostly of very high co-efficient of deliquescence and consequently free use of glue as the binding agent is undesirable, as the absorption of moisture in quantity does not permit of retaining the different ngredients of the composition in adherence amongst themselves and with the splint. Shellac dissolved in methylated spirit makes an efficient agglutinant for the purpose and he use of some varnish keeps off the moisture effectively.

### TYPICAL RECIPES

The following recipes are reproduced ere from the book entitled "Safety Matches" by Mr. K. C. Das Gupta.

#### RED LIGHTS

| | I. | II. | III. |
|---|---|---|---|
| Potassium chlorate | 40 | 20 | 15 |
| Strontium nitrate | 120 | 20 | 25 |
| Sulphur | 20 | 5 | 13 |
| Lamp black | 4 | 1 | 1 |
| Chalk | — | 1 | — |
| Antimony sulphide | — | — | 4 |
| Glue | 6 | 2 | 2 |
| Shellac | 8 | 2 | 3 |
| Copal varnish | 11 | 2 | 3 |

#### GREEN LIGHTS

| | I. | II. | III. |
|---|---|---|---|
| Potassium chlorate | 32 | 70 | 200 |
| Barium nitrate | 160 | 300 | 250 |
| Sulphur | 32 | 100 | 100 |
| Lamp black | 8 | 15 | 10 |
| Barium chlorate | — | 200 | — |
| Glue | 7 | 20 | 13 |
| Shellac | 10 | 25 | 28 |
| Copal varnish | 5 | 10 | 8 |

#### SIDE PAINTING COMPOSITION

The following are some typical formulas of side painting composition as recommended by Mr. K. C. Das Gupta in his book "Safety Matches".

| | I. | II. | III. |
|---|---|---|---|
| Red (phosphorus) | 40 | 30 | 64 |
| Black antimony sulphide | 35 | 40 | 64 |
| Manganese dioxide | — | 10 | — |
| Chalk | 2 | — | 7 |
| Potassium dichromate | 2 | 10 | — |
| Glass powder | 5 | — | 6 |
| Asbestos powder | — | — | 2 |
| Glue | 12 | 14 | 5 |
| Gum arabic | — | — | 14 |
| Gum tragacanth | 1 | — | 1 |
| Dextrine | — | — | 3 |
| Water | 75 | 80 | 100 |

### GENERAL PROCESS OF MANUFACTURE

The splints having been ready the match head composition is prepared. For this purpose take the glue and soak same in two to three times its weight of water and dissolve by boiling on water bath to a clean viscous fluid stirring all the time. Pass this through a sieve and weigh and note the loss in weight. Take hot water equal to this loss and wash the glue pot and the sieve and the washings into the strained solution.

Take shellac in a separate pot and keep it soaked for a few hours in double its weight of methylated spirit and keep it covered airtight as much as possible. Stir well when the shellac has gone into solution.

When the glue and shellac are thus dissolved and ready, mix the two solutions together. Shellac solution should be added gradually and not the whole quantity abruptly into the glue solution. Stirring must be done constantly while so mixing, and care should be taken to prevent thickening. Lastly add the copal varnish into this mixture of solutions and stir to a homogenous consistency. Then add the dry chemicals and grind the whole batch well in a conical mill when the composition is ready for dipping.

On dipping into the composition they : dried in atmospheric temperature and fanning. The drying is completed in out 12 to 24 hours' time according to the ciency of the drying arrangements. 'hen thoroughly dried, they are again ped into the safety match composition the usual way. The match composition generally coloured red by the addition Eosine and Rhodamine in very small oportions to the same rendering them form agreeable red tips. The match ads are then dried, the frames emptied d the matches are filled into boxes by elves in each. The boxes are then par- led into dozen and packed into thin tin zinc sheet cases containing 10 dozen in ch when they are ready for the market.

**BENGAL FIRE**

Bengal fire is the simplest form of fire- rk, and simply consists of a moderately rcely burning mixture containing suitable lts to impart colour to the flame, stron- m and calcium being used to produce d, barium or copper for green etc. Many ferent mixtures can be used, of which e following may be considered typical:—

RED

| | | |
|---|---|---|
| Potassium chlorate | 15 | parts. |
| Strontium carbonate | 15 | ,, |
| Shellac | 7 | ,, |

YELLOW

| | | |
|---|---|---|
| Sodium nitrate | 70 | parts. |
| Sulphur | 20 | ,, |
| Antimony sulphide | 7 | ,, |
| Charcoal, powdered | 3 | ,, |

GREEN

| | | |
|---|---|---|
| Barium nitrate | 66 | parts. |
| Sugar | 33 | ,, |
| Shellac | 1 | ,, |

BLUE

| | | |
|---|---|---|
| Potassium chlorate | 45 | parts. |
| Charcoal, powdered | 5 | ,, |
| Mercurious chloride | 35 | parts. |
| Shellac | 5 | ,, |

**CONCLUSION**

The handling of explosives, naturally, is never entirely free of danger. No more so is electricity, gasoline and many other things in daily use yet many persons have devoted long lives to the making of fire-works without having an accident. Even with the greatest care, however, accidents will occur to both those employed in making fireworks as well as those burning them. It is here endeavoured to point out the most fruitful sources of accident though obviously it is impossible to foresee every instance in which some carelessness or unknown factor may bring on disaster.

First, always keep separate places, a considerable distance apart to be used for making so-called "plain mixings" as rocket romancandle and gerbe composition containing sulphur, and the coloured mixings containing chlorate of potash. Separate sieves and utensils of every description must be employed and those working in the "plain" sections of the factory must not go into the rooms of those in the "coloured" sections.

Second, keep in mind that very slight friction will sometimes start the burning of mixtures of finely divided chemicals. Star composition has been known to explode while being sifted, by scratching the brass wire sieve bottom with the finger nail, while rockets have taken fire from the brass solid rammer striking the top of the spindle while ramming.

Third, finely divided metals, when in contact with chlorate of potassium sometimes take fire suddenly. While fortunately this is seldm the case it must not be lost sight of. Even steel filings and iron borings frequently become quite warm when mixed with saltpetre etc. and rammed

from this action. The prevention of this has been explained under "Steel Filings".

Employees in the mixing and ramming rooms of factories should be required to wear rubber shoes whole at work and a constant source of danger is the carrying of matches. This cannot even be controlled by requiring the employees to change their clothes in the factory before going to work and having them wear garments without pockets as they will sometimes slip out for a smoke during rest hours and have matches secreted somewhere about their persons.

Small buildings should be supplied, about 12 feet square and not less than 50 feet apart all those engaged in mixing and ramming operations as well as for those making stars and as much as possible have one person to a room. Doors should be placed at both ends of work rooms and should always open to the outside with no fastenings on the inner side but held closed, if desired, by spring hinges. Fire buckets, inspected daily should be on each buildings, supplemented by fire hose conveniently placed for emergency.

The most successful method of reducing the liability of serious accidents to a minimum is to keep at all times the least possible amount of composition on hand in the work rooms and to remove to storage of finishing rooms all rammed articles as quickly as they accumulate.

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## —PHOTOGRAPHY AS A HOBB

PHOTOGRAPHY in these days finds its place in every department of life. It has always provided a thrill for the beginner. It is probably the same thrill that comes from the ability to make pictures, and which inspired primitive man to the desire for personal records of incidents, are all contributive to the wide use of photography. For the beginner there is the delight of seeing his first successes, negatives processed and prints made under his own hand, or it may be the scarcely lesser thrill of opening the wallet containing the results of his first exposures, because either through disinclination or force of circumstances he places the exposed film in the hands of those who do the mystereous "rest".

In carrying out the operation the photographer must equip himself with a range of subjects being photographed.

### TAKING AN EXPOSURE

The key to successful photography lies in correct exposure. The best camera, the finest quality of materials, and the highest skill in developing and printing are of little use unless the photographer realizes the importance of the part played by correct exposure.

By correct exposure we mean the period of light action on the film by the lens and shutter. It is necessary for the film to have sufficient exposure, but this must not be excessive. If the exposure is too short and "under-exposure" results, the negative will be thin and transparent and there will be no detail in the darker parts of the subject, resulting in black paper shadows in the print on the other hand if the exposure is excessive the result will be a negative in which the lights and shadows of the subject will not be seen in their the print will lack what is turned "spark and vigour.

To explain this in another way, if subject is one composed of strong h lights such as the sky and deep shad under trees, it may be found that the s needs 1/100 th part of a second, with deep shadows may need a whole seco The other parts of the subject will n exposures between these two extremes.

If the exposure of 1/100 th of a secc is given it is obvious that the sky will recorded and also some detail in higher lights, but there will be no det in the shadows, and these will be clear fi If the exposure of one second is given the shadow the sky will be over-expos by 100 times.

Fortunately for the photographer th is another factor entering into the matt This is the properly described as latitu of the film. It means in practice t although the sky might have received 1 times the exposure that it should have, it still possible to record it in the negati Plates or films respond better to over-e posure. The photographic image depen upon the light action by exposure, a provided that the action is not excessive good negative is still possible. No chen cal process can supply the deficiency the image due to under-exposure.

With a film having a reasonat margin of latitude it is not a difficult matt to secure good negatives. The use of so form of exposure-meter or calculator involved. This is simply a means arranging the factors controlling the e posure in their proper relationship, a after so doing the exposure is indicated.

### PROCESSING

The exposed films or plates are, mi

be said if it is in any way possible in favour of doing the work at home. It is safe to say that no camera user who has a keen interest in his hobby is going to be satisfied with the work of other not because the resulting prints lack the technical quality, but because there is great satisfaction in doing the work for himself.

One of the reasons why many photographers place their exposed plates and films in the hands of the trade for processing is because the operations involve a considerable amount of time. Actually this is not the case, for while the operations may be conducted in an unbroken sequence except for intervals while the negatives and prints are drying. In order to show the rapid way of developing and printing films and plates we are describing the simplest and easiest processes in the development.

The process of development is that by which the action of light upon the sensitive film productive of an invisible or latent images is revealed by chemical action as a negative. This is done in the first stage by the use of a solution consisting of several elements known as developer. There are many different photographic developers each with advantages to offer. These include Pyro, Metol, Hydroquinone, Amidol, Para-amido-phenol, and Glycin. These are used in conjunction with other chemicals.

(1) Alkali, which accelerates the action of the developer.

(2) Preservative, sulphite, by which the developer is preserved while in solution.

(3) Restrainer, potassium bromide, by which the activity of the developer is controlled.

There is no need for the inexperienced photographer to investigate the claims of different developers. He is advised to purchase any of the well-known proprietory developers and to use it in accordance with the maker's directions. It is certainly the best plan for the beginner.

The following methods of development may now be considered with their respective advantages.

### TANK DEVELOPMENT

This method offers in some cases the important advantage of dispensing with the dark-room. The plates or films are placed in the tank, and the developer permitted to act for a certain time according to its strength, the type of plate or film, the negative required and the temperature of the solution. These times are given in the form of a table with the developer used.

It is admitted that the tank method gives the photographer a high percentage of successful negatives for the simple reason that it eliminates guesswork as to how far to carry development. The operation is reduced to an exact science. Tank development offers the advantage that the negatives are not handled more than is necessary, and this means freedom from the risk of mechanical defects.

### TANK DEVELOPMENT IN PRACTICE

This is the most simple system of development, and at the same time is the easiest for the beginner. Modern tanks are easily loaded, and once the plates or films are in the tank the rest of the operations can be carried out in daylight. This system has been brought to perfection within recent years with regard to the design of the tanks for easy loading, and there is considerable improvement in the developers that are suited for use with them.

It was argued that tank development permitted the photographer no control over the result in the case of under or over-exposure. There was the belief, which died hard, that alteration of the composition of the developer allowed of incorrect ex-

posure being compensated for. Expert investigation has dispelled this idea. It is safe to say that a fixed period of development is one which, while based upon the assumption that a correctly exposed plate or film needs development for a fixed period, will allow the best to be made of under or over-exposure.

The fixed period of development is based upon the negative necessary for a given printing process. This is determined by the maker of the developer who in his experiments finds that for an "X" plate or a "Z" film the time of development is sixteen minutes at 65°F. This presupposes a correct exposure. It will also follow that the period of development which is correct for the film which has had correct exposure is also the best for those which have been incorrectly exposed. This was the system devised by Messrs. Kodak for use with their film tank designed to eliminate the need for a dark-room for the amateur photographer.

For the benefit of those photographers who have never watched a negative develop, it may be explained that the rate of development depends upon the exposure of the film. The under-exposed film develops slowly because of the deficiency of light action, the over-exposed plate or film "flashes up" in the developer instead of the high lights appearing first and the rest of image gradually revealing itself. It happens that the under-exposed negative is developed too far in the hope that a little more detail will be brought out, while the over-exposed negative is "rushed out" of the developer before it has had long enough to secure sufficient density. If this happens the negative is weak and lacking in the necessary contrast.

Therefore a fixed time of development based upon correct exposure avoids the risk of the under-exposed negative being image being removed too soon. While fixed period is in the nature of a compromi it is the best course, and the choice of tl correct developer time gives the best nega tive, and the careful choice of a printin paper makes a good if not a perfe photograph.

For the loading of a developing tar the reader is referred to the directio issued with the apparatus, and care mu be taken to see that these are followe exactly. If this is not done there is the ri of the developer not reaching the film pro perly, or in the case of a tank of the day light-loading variety which is in the natu of a mechanical device, there is the ri that the film may not enter the tank in tl proper way, and in this case it is likely be spoiled.

It may be thought from the first rea ing of the instructions that the manipulatic of the tank is a difficult matter, but this not so, and after the instructions have bee read through once or twice the operati of the mechnism will become clear. Aft one or two films have been developed the will be no need to refer to the instructic sheet. Plate tanks are very simple to us the plates being dropped into the groov which hold them. Film pack, or cut fil exposures, are placed in the special holde which are provided for them.

Apart from the loading of the tar there are several other points which be upon successful work. The develope should be poured into the tank so that tl plates or films are covered as quickly possible. Failure to ensure this may resu in irregular development and marks on tl negatives. Some workers advise that tl tank should be filled with the developir solution first and the plates or films lower into it. It is important that the solutic should be constantly agitated during tl period of development or the same defec

are a problem, as they result in clear circular spots on the negatives. They are often the result of too vigorous shaking of the developer either in its bottle or in the tank. In some cases the design of the tank makes for the formation of air bells and patches of irregular density on the negatives, but this was more the case with some of the older patterns, where there was insufficient space between the negatives with plate-tanks which carry the strip in a celluloid "apron" for development. Modern tanks are superior to those of the older type and give no trouble in this respect provided that they are properly used.

The time of development is controlled by several factors: the type of film whether it needs a long or a short development, the temperature of the developer and its working strength, and, finally, the type of negative that the photographer requires for the printing paper to be used. This is all decided for the photographer by the makers of the particular developer used, and the photographer is advised to use one of the several proprietary developers which are suited to tank development. This resolves the problem of development to finding the group in which the plate or film is placed, and it will be found that at the temperature at which the developer is working the operation will be complete in a given number of minutes.

Care is necessary to ensure that the temperature of the solution is that recommended by the maker. It must not be lower than 50°F., because some developing agents lose their power at a lower temperature. On the other hand, a high temperature is to be avoided as this will cause a softening of the gelatine film, and cause the "grain" of the negative to be coarser.

### FINE-GRAIN DEVELOPMENT

The user of a "miniature" or small camera needs to be more exacting in his requirements with regard to a developer for his films than is necessary with negatives of larger size. It must be realized that the small negative is made with a view to enlargement, and it is essential if the large prints are to be satisfactory that the negative should be of the correct type. It is also very important than it should be of "fine grain". The photographic image is composed of very minute silver grains suspended in a film of gelatine. The size of these silver grains and the avoidance of their tendency to "clump together" determine the quality of an enlargement. The maker of the film does his best towards the provision of the essential condition, and modern films are a great advance over those of a few years ago in this respect, but in spite of the production of fine-grain film the photographer has to do his part with regard to exposure and development. A fine-grain developer is essential in the case of small negatives from which enlargements of great size are wanted. There are several excellent fine-grain developers, and some of super-fine grain. These should not be used by the beginner as their use involves extra exposure of the film, which is not always possible.

The fine grain developers supplied in tins ready to be dissolved for use by almost all photographic manufacturers should be used.

Fine-grain developers also give the right type of negative for enlargement. For this the negative needs to be of what is termed a "soft gradation" type. It means that the black silver as representing the high lights of the subject must not be opaque, or the light from the enlarger will not penetrate the density, and the print will show white paper devoid of any suggestion of light action.

In this connection it might be pointed out that in some circles such attention is devoted to the subject of grain that the impression may be conveyed that the problem is difficult of solution. To put this in another way the impression is given that

it is more difficult to secure reasonably fine grain in miniature negatives than it actually is. The "grainless" emulsion has not yet been produced, but with modern films and fine-grain development no trouble will be experienced if care is exercised.

Grain, apart from the film, will be sufficiently fine to permit of considerable enlargement if the following points are observed:

(1) The developer should be used at the strength recommended by the makers.

(2) The solution should be used at 60° to 70°F., and no higher, and fixing-baths should be of the same temperature as the developer.

(3) The developer should not be used to the point of exhaustion.

It is necessary to use a thermometer in order to ensure that the temperature is correct. When the subject is one that it is thought will demand a very large picture, one of the specially fine-grain films of lower speed should be used. High speed in a film is obtained at the expense of fine-grain.

The commercial fine-grain developers may be used for three or four films in succession or at intervals if properly stored. It is false economy to overwork the developer, because this will certainly involve some loss of quality.

### FIXING

The next operation is that fixing the film. This is the removal of the silver that is seen in the creamy appearance on the back of the negative. If the film is examined in very weak light it will be seen that this creamy appearance begins to disappear, and in few minutes the negative will be fully transparent.

If the tank is made of metal an acid fixing-bath must not be used, as the acid would attack the metal plating. The only safe course if the tank contains metal parts that the plates or films be removed fro the tank after the developer is washed fro the film, and fixed in a separate vessel.

The tanks made of bakelite or simil material are unaffected by the chemica used.

It is very important that fixation shou be complete. The creamy appearance the negative is a partial guide, but the ba should be allowed to act for at least as lo again. Films and plates vary with rega to the time taken for the solver to fix ou with some it takes place more rapidly tha others. An acid fixing-bath with a har ening element is to be preferred to a pla hypo bath, and most photographers use th acid bath. If the photographer prefers make up his own fixing-bath the followin is a good formula:—

| | | |
|---|---|---|
| Hyposulphite of soda (hypo) | 4 | ounces. |
| Water | 20 | ,, |

The hypo will dissolve more readily warm water, but it must not be used unt cold.

An acid fixing-bath is made up follows:—

| | | |
|---|---|---|
| Hyposulphite of soda (hypo) | 8 | ounces. |
| Potassium metabisulphite | ½ | ounce. |
| Water | 20 | ounces. |

In hot weather it is a good plan to use an acid fixing-bath which exerts a hardening action on the film. It will prevent the possibility of frilling, and assist in avoiding mechanical damage to the film in its wet state. The bath is made up as follows:—

| | | |
|---|---|---|
| Hyposulphite of soda | 1 | lb. |
| Potassium metabisulphite | 1 | ounce. |
| Chrome alum | ½ | ,, |
| Water | 40 | ounces. |

To make up this solution the hypo is dissolved and the metabisulphite added. Hot water should be used, and the solution

lved in ten ounces of water and added to e remainder of the bath.

If the photographer does not wish to › to the trouble of making up his own ›lutions the acid fixing salt, sold by all ıotographic dealers, will meet the case.

When the fixing is done in the tank, ashing may follow without the removal ' the film. This will serve to clear the tank ' hypo, and it will only need a rinse with arm water before using again. Many ıotographers make a practice of develop- g, fixing and washing in the tank, and ey do not see the negative until they are ady for drying. The beginner will pro- ıbly not be able to resist the temptation see what his negatives are like for as long ; this. If the film is developed in a tank hich holds it in the grooves of a spiral, it ill not be possible to reinsert the film with- ıt risk of damage. Plates and cut films, ıd the films developed in a tank which ›lds them in a cellouloid "apron", can be spected and returned to the tank quite ısily.

## WASHING

This is a mechanical operation but one ıat is too important to permit of careless- ːss. Films that are developed and fixed the tank are best washed in the same ınk, and this also applies to plates. Roll 'ms that are developed in the strip should washed by pinning the ends together ith the celluloid side or the back of the lm inwards. The film is then placed in large bowl or similar vessel. Films if not ırolled as described will coil up, and the ıter has little effect on the negatives on ıe inside of the roll.

Efficient washing does not demand a ›rge quantity of water; in fact, those work- rs who use the most water are not those ho do this part of the processing most ffectively. The point is the hypo is easily emoved from the film; it is heavier than he water and sinks to the bottom of the vessel. It must be removed or the film will be simply subjected to a prolonged soaking in what is a dilute hypo solution.

Running water is preferable to wash- ing in a series of changes, but the hypo must be drawn off from the bottom. If the water is simply allowed to pour in at the top of the tank or vessel and runs over, this is not removing the hypo-charged water at the bottom. In these case it is necessary to remove the film, allow the sur- plus water to drop or, remove the water from the bottom of the vessel, preferably by rinsing it, and then to replace the film in fresh water.

The same result is obtained by giving the film six or seven changes of water, each change lasting from four to eight minutes. A series of short changes of water is far more effective than indiscriminate use of running water or prolonged soaking; the latter especially is to be avoided as it has a bad effect on the film.

## DRYING

After washing the surface, the negative (in the case of films the back or celluloid side as well) should be rubbed lightly with a tuft of cotton-wool. This will remove any deposit that may have accumulated from the washing water. It is sometimes necessary to give negatives a final bath of 1 per cent. acetic acid, in order to remove the lime salts present in some water, and which dry in the form of scum on the film and are difficult to remove afterwards.

Plates or cut films are given two minutes in the acid solution. Films are see-sawed three times through. A final rinse of five minutes should follow, after which the negatives are surface-dried either with a soft chamois leather or "viscose" sponge and set up to dry.

Plates are best stood on a shelf in a warm room. Films are best pinned up to a shelf where they will not come into con-

ect with anything while drying. In the ase of roll films it is a good plan to attach a weight to the lower end of the strip while drying, as this will help in counteracting the tendency of the film to curl.

While a warm room is advocated, heat must not be applied as this will cause the gelatine film to melt, while it may affect the "grain" of the negatives adversely.

### AFTER DRYING

Photographic negative are necessarily delicate and easily damaged by misuse. After drying they should be put away from dust, damp or careless handling. Plates may be stored in the boxes in better still in the commercial negative albums sold for the purpose. Miniature negatives are best kept in the strip or cut into short lengths of four or six.

### PRINTING

The making of the negative is only a stage in the production of a photograph, although a very important one. The quality of the negative has a considerable effect on the print, for not only is it a fact that the perfect print can only be made from the perfect negative, but also the size and the type of print are limited by the perfection or otherwise of the negative. Moreover, the negative must be of the right type for its particular purpose, for while a negative may be described as "good", it might also be added that it may be limited in its range.

In these days with the wide range of printing papers obtainable it is possible to make passable prints from almost any negative, but these are often imperfect judged from the more critical standards. The best photographs are those made from correctly exposed negatives in the first instance and developed to suit the printing process to be used.

For an amateur photographer the print-

In this method the paper to be printed is expected in contact with the negative. This means that the print will be of the same size as the negative. There is more scope when contact prints with regard to the method of printing to be used. Prints may be made upon gaslight or any of the wide range of bromide papers, or they may be made by daylight upon any of the printing out papers and self-toning papers.

Contact printing can be done in a printing box which is fitted with an electric light for exposure. A glass top is fitted to take the negative, and this is laid in contact with the printing paper on the glass the light switched on by pressure of a back board, making the exposure. This is both rapid and convenient. Printing boxes of this type for lighting from the mains as well as from a battery may be bought from photographic dealers.

If the printing box is not considered necessary a printing frame must be used For plates this should be of the same size as the negative for plate negatives, but for films it is convenint to have the frame a size larger than the negative, especially if it is desired to give the print a white egde for which a mask to protect the edges from light action is necessary.

For making prints by contact on bromide paper the test strip is advised, the printing frame being placed at a fixed distance from the light and the frame graduall uncovered so that the negative receives exposure of five, ten, fifteen and tewent seconds.

The printing lamp should be switched to operate independently of the drak-room light, and it should not be too strong, a 25 watt pearl lamp is quite powerful enough

### PRINTING WITH GASLIGHT PAPERS

Contact printing is advantageousl done by gaslight papers because they ar less sensitive and drak-room is not neces

:ortable lighting conditions of an ordi- r room. These papers have not the :d of bromide papers, and print making ather a longer process because longer e is needed for exposure. On the other ıd, prints on these papers develop more ıidly.

Gaslight papers develop more rapidly ın bromide prints. The image in the for- :r case appears very quickly, and a pro- rly exposed print is fully developed in s than a minute. The image appears, and the case of a correctly exposed print it ll seem to stop, and the print is then ısed and placed in the fixing-bath. If e print is over-exposed the picture will ash up" in the developer and darken over pidly. If it is rushed off the developer in e hope of saving it the colour will be of sty black instead of the cold black.

It is important that the print should be ısed between developing and fixing. herwise stains mat appear that are fficult to remove. Care must be taken ɔt to use the developer to the point of ex- ıustion, and to keep prints under the ılution. If the developer is exhausted the ·ints will be of poor colour and liable to :come stained, and the same happens if e film is exposed to the air in the fixing- ıth, especially before the silver has been ked out.

Thorough washing is also necessary. rints on gaslight paper may be regard- l as reasonably permanent, provided ıat they are properly fixed and washed ee from hypo.

Finally, with regard to the parmanence f both bromide and gaslight prints, it may e stated that efficient fixing is of greater nportance than washing.

A small quantity of hypo in a print oes little harm until it begins to decompose ırough the action of damp.

Provided that the print is stored under ry conditions it will last for many years.

**NEGATIVE FAULTS AND THEIR REMEDY**

Until experience has been gained there may be failures, and it is well that the cause of these should be ascertained with a view to prevention in the future. The following are the failures most commonly met with.

Under-exposure. — This is indicaded by the fact that the image is a long time appearing. After development the negative is "thin" and transparent and there is little or no shadow detail, it being almost clear film.

Over-exposure.—The negative is dense and the shadow detail is almost as strong as the high lights. The sky will be thin due to excessive exposure.

Under-development. — A. Following correct exposure. There is a mere trace of image.

Remedy—Intensification.

B. Following under-exposure. A weak image, shadows transparent.

Remedy—Intensification effects slight improvement.

C. Following over-exposure. The negative lacks contrast, the shadows almost as strong as the high lights.

Remedy—Slight reduction makes partial improvement.

Over-development. — A. Following correct exposure. The negative shows detail in high lights, but they are too opaque to print. The shadows show too much detail.

Remedy—Reduction.

B. Following under-exposure. The negative shows detail in the high lights and shadows, but the former are much stronger than should be the case. It must be noted that the effect of over-development may be compensated for by the choice of a printing paper of a different grade, and what may be an over-developed negative for one paper may not be so for another.

Remedy—Reduction effects slight improvement.

C. Following over-exposure the negative lacks "contrast" or proper balance between the high lights and shadows, which results in a flat print which fails to give the gradations of the subject.

Remedy—Reduction.

#### OTHER DEFECTS IN NEGATIVES

White Circular Spots (small)—These are termed "pinholes," and are generally caused by minute particles of dust on the film which prevent light action.

May also be caused by undissolved particles in the developer becoming attached to the film immediately the developer is applied and preventing action.

White Circular Spots (large).—These are generally caused by air bells becoming attached to the film and preventing the developer from reaching it. They are removed by spotting the negative with opaque colour.

Scratches.—These are serious defects, and especially in the case of small negatives. The cause should always be traced with a view to future prevention. Film sometimes have scratches running across the negative in the direction in which the film has been wound. These are termed "telegraph-wire scratches." There are several possible causes. The first is dust or particles of grit on the surface of the back frame of the camera across which the film travels, or roughness on some part of the apparatus over which the film runs. These are sometimes met with in film-pack negatives.

Winding the film with the camera closed will also cause scratches across the negatives. With some cameras there is very little space between the film and the folded bellows, and if the film is wound

Twisting the film on its core in ord[illegible] to exclude light is a practice of so[illegible] workers, and is to be deprecated. A[illegible] good camera will ensure that the film [illegible] tight enough, and if the spool is seale[illegible] after exposure, and not subjected to t[illegible] action of strong light, there is no fear [illegible] fogged negatives.

#### SCRATCHES ON THE WET FILM

Scratches on the film while it is [illegible] wet state are easily recognized, and the[illegible] is no need for them provided that the fil[illegible] is used carefully. Roughness on the su[illegible]face of the developing tank or the washin[illegible] vessel will cause scratches on negative[illegible] and also fine particles of grit on the su[illegible]face of the sponge of chamois leath[illegible] used for drying the surface of the fil[illegible] after washing, previous to drying.

#### INTENSIFICATION AND REDUCTION

It will be realized that if the photo[illegible]grapher has devoted a reasonable amou[illegible] of care to exposure and development [illegible] should not be necessary to apply an[illegible] chemical process to the negative with [illegible] view to partial compensation for shortcom[illegible]ings in one respect or the other. With th[illegible] wide range of bromide and gaslight pape[illegible] it is possible to do as much or even mor[illegible] than can be done by chemical after-trea[illegible]ment and without the risk that is inevit[illegible]able when a negative is rewetted.

The two processes by which a negati[illegible] is modified are known as intensificatio[illegible] and reduction. Both are chemical proces[illegible]es, the one adds to the density of the ima[illegible] already produced, the other reduces it.

Intensification will be considered firs[illegible] There are several methods, but the obje[illegible]tion to them is that they involve the use [illegible] highly poisonous mercuric salts and fo[illegible] that reason they are not advocated. Th[illegible] best intensifier for amateur use is th[illegible]

tion of bichromate of potash, or hydrochloric acid. Actually chromium is added to the silver image of the negative. Washing follows and the negative is then placed in a non-staining developer. This method is simple and effective and avoids the use of highly poisonous chemicals. It should be realized that the effect of intensification is strengthened the image already there. It will not reveal any image not produced owing to deficient light action.

The following is a good formula:—

| | | | |
|---|---|---|---|
| A. | Potassium bichromate, | 1 | oz. |
| | Water | 20 | ,, |
| B. | Hydrochloric acid | 2 | ,, |
| | Water | 20 | ,, |

For use take equal parts of each and a like quantity of water.

Intensification to be successful requires that the negative should be well fixed and thoroughly washed. Neglect of this will cause stains which are not easy to remove. The process may be carried out after the final washing, and this is the best time to do it as the negative responds better and the risk of rewetting the film after it has once dried is avoided. If the film has been dried it should be soaked for twenty minutes before bleaching.

The solution prepared, the plate or film is placed in a clean dish and the solution poured on. The dish should be rocked. The film will be seen to bleach to a yellowish brown colour, and if the negative is examined against a dark object the picture will be seen as a positive (print). The operation should be carried on until the full positive is seen. This takes from three to five minutes. The operation should be carried out in subdued daylight or artificial light, not in strong daylight.

The negative must then be washed until it is free from the yellow stain. This is important and the bichromate stain is persistent. If it is desired to finish the negative quickly a few grains of potassium metasulphite may be dissolved in two or three ounces of water and applied to the negative. This will remove the stain at once.

After the yellow stain has been discharged the negative is placed in a non-staining developer. It will darken over almost at once, but the devloper should be given full time to act or the maximum effect of the process may not be obtained. This should be done in strong light and at least five minutes allowed. No fixing is necessary, the negative being washed for about twenty minutes and dried.

The success of this method of intensification can only be judged by making a print, and it often has a greater effect than may at first be thought.

### REDUCTION

This consists in dissolving some of the negative image so that the contrasts of the negative are better and the result of over development corrected. There are two reducers, both of which may be obtained ready prepared—the best course, as the process, like intensification, is used but seldom.

The persulphate reducer is useful because it improves the contrasts of the negative by removing the detail. The Farmer reducer (ferricyanide and hypo) by acting first on the shadows will improve a negative which has been over-exposed and over-developed. The latter is more certain in its action than the persulphate.

All that is necessary is to place the negative in a clear dish and to pour the solution on. It should be stopped immediately the action has gone far enough in the case of the persulphate by placing the negative in a solution of sodium sulphite. The Farmer reducer is arrested by washing. These reducers are best bought ready prepared.

## —PHARMACEUTICAL RECIPE

### COMPOUND POWDER OF KALADANA

| | | |
|---|---|---|
| Kaladana, in fine powder | 700 | grams. |
| Potassium acid tartrate finely powdered | 700 | ,, |
| Ginger, finely powdered | 600 | ,, |

Mix.

Dose:—60 to 90 grams.

### LIVER PILLS

| | | |
|---|---|---|
| Podophyllin | ½ | gr. |
| Rhubarb | 2½ | ,, |
| Extract of hyoscyami | 2 | ,, |
| Mucilage of tragacanth | q. s. | |

Triturate the ingredients in a mortar and make into a stiff dough. Then make into pills. The above composition is sufficient for one pill.

### WHITE ANT KILLER

| | | |
|---|---|---|
| Orthodichlorbenzal | 24 | parts. |
| Solvent naphtha | 45 | ,, |
| Betanaphthol | 4 | ,, |
| Rosin | 4 | ,, |
| Rect. spirit | 7 | ,, |

Mix all together and keep in air tight inversion bottles.

### INDIGENOUS TONIC

| | | |
|---|---|---|
| Gulancha | 1 | dr. |
| Chirata | 1 | ,, |
| Ginger | 1 | ,, |
| Water | 1 | pint. |

Boil down to half.

Dose:—1 ounce after fever as a tonic.

### CATARRHAL INHALANT

| | | |
|---|---|---|
| Menthol | 320 | gr. |
| Pine oil | 160 | mins. |
| Lavender oil | 80 | ,, |
| Cinnamon oil | 30 | ,, |
| Origanum oil | 144 | ,, |
| Eucalyptus oil | 120 | ,, |
| Liquid formaldehyde | 40 | ,, |
| Rectified spirit | 8 | oz. |

Mix.

### GLYCERINE SUPPOSITORIES

Glycerine suppositories are very much used to produce faecal discharge in constipation. They act by locally irritating the mucous membranes of the rectum, and are often satisfactory, though never really purgative. As an occasional remedy they are useful but their habitual employment is probably injurious to the mucous membrane.

| | | |
|---|---|---|
| Gelatin, cut small | 14 | grains. |
| Glycerine | 70 | ,, |
| Distilled water | 16 | ,, |

The gelatin is soaked in the water for 5

ed on a water-bath until the gelatin has di ed and the contents of the dish have beer porated to a definite weight, which corres to 70 per cent. by weight of glycerine.

When the mixture has arrived at the co weight, allow to stand for two or three mi remove the scum that rises, and pour slightly oiled moulds.

The liquid mass is poured into m having a capacity of 15 grains (for inf 30 grains (for children), 60 grains or 120 g (adult's medium or large) as may be req

In moulding the suppositories it utmost importance to lubricate the mould almond oil applied on cotton-wool and t the mould so that any excess of lubricant drain out. By doing so the moulded mas not stick to the surface of the moulds.

### FEVER AND AGUE MIXTURE

| | | |
|---|---|---|
| Quinine sulphate | ½ | dr |
| Sulphuric acid dil | ½ | ,, |
| Syrup of orange | 6 | z |
| Glycerine | 4 | dr |
| Distilled water to make | 8 | o |

Dissolve the quinine in the sulphuric and then mix with the other ingredients. I add the water to make up the required vo

### TINCTURE BENZOIN COMPOUND

| | | |
|---|---|---|
| Benzoin, in powder | 100 | grar |
| Storax | 75 | ,, |
| Balsam tolu | 25 | ,, |
| Aloes | 20 | ,, |
| Alcohol 90 p. c. to make | 1000 | c. c. |

Macerate the benzoin, storax, balsam and aloes with 800 c. c. of alcohol in a c vessel for 2 days, shaking occasionally; pass sufficient of the alcohol through the to produce the required volume.

### MOUTH WASH TABLETS.

| | |
|---|---|
| Sodium bicarbonate | 8 |
| Saccharine | 1 |
| Vanillin | 20 |
| Coumarin | 20 |
| Acid benzoic | 20 |
| Oil cloves | ½ |
| Oil caraway | ½ |
| Oil lemon | ½ |
| Oil gaultheria | ½ |
| Oil menthol | ½ |
| Acid carbolic | ½ |
| Oleo-resin capsicum | ½ |
| Carmine | 20 |

Mix, granulate and make into 5 gr. ta One to be dissolved in half a wine glassf water and used as a mouth wash.

The basis for the mouth wash ta

### FLOOR POLISHING WAX

| | | |
|---|---|---|
| Spermaceti | 4 | oz. |
| Hard paraffin | 4 | „ |
| Talc | 8 | „ |

Melt the spermaceti and hard paraffin [to]gether over slow fire. Then remove the [so]urce of heat and add the talc with stirring [un]til thoroughly incorporated with the mixture. [W]hen cooled reduce the product into a granu[la]r powder. Pack it in perforated container, [w]ith directions to sprinkle on the floor.

### TELEPHONE DISINFECTANT CLEANSER

| | | |
|---|---|---|
| Thymol | 1 | gram. |
| Pine oil | 15 | drops. |
| Peppermint oil | 15 | „ |
| Alcohol, denatured | 5 | c. c. |
| Tincture of green soap | 10 | „ |
| Water to produce | 50 | „ |

Mix.

### LABEL VARNISH

| | | |
|---|---|---|
| Sandarac | 6 | oz. |
| Mastic | 3/4 | „ |
| Venice turpentine | 150 | grains. |
| Alcohol | 16 | fl. oz. |

Macerate with repeated stirring until solu[t]ion is effected, and then filter.

### TABLE SAUCE

| | | |
|---|---|---|
| Vinegar | 1 | qt |
| Powdered pimento | 2 | [illegible] |
| Powdered cloves | 1 | dr. |
| Powdered black pepper | 1 | „ |
| Powdered mustard | 2 | oz. |
| Powdered ginger | 1 | dr. |
| Common salt | 2 | oz. |
| Shallots | 2 | „ |
| Tamarinds | 3 | „ |
| Sherry wine | 1 | pint |
| Capsicum | 1 | dr. |

Mix all together, simmer for 1 hour [illegible] strain it, and fill in bottles.

This sauce is never quite clear; stra[ining] to remove the coarser particles is all [that is] necessary.

### DEPILATORY SOAP

| | | |
|---|---|---|
| Coconut oil | 907 | grams |
| Caustic Potash lye 33 p. c. | 1915 | „ |
| Castor oil | 1844 | „ |
| Glycerine | 453 | „ |
| Starch | 113 | „ |
| Sodium sulphide | 907 | „ |
| Citronella | 2 | dr. |

Put the castor and coconut oil in an iron pan over a moderate fire. Then pour the glycerine. Apply heat and when the temperature is nearly 100°C slowly stir in the caustic [illegible] lye. Continue heating and stirring until the whole of the mixture is saponified. Add water if required. When the soap has been prepared, remove the pan from the fire and incorporate the starch, and the other two ingredients. Allow the mass to cool and then cast into cakes of usual size.

### TRANSFERRING PHOTOS TO GLASS

Where it is desired to transfer photos to glass for display [illegible] process may be [illegible] little [illegible] should give [illegible]. [illegible] glycerine, preparation, [illegible] can be made up with[out] difficulty.

| | | |
|---|---|---|
| Glycerine | [illegible] | oz. |
| Gelatin | 1 | „ |
| Water | 8 | „ |
| Alcohol | 3 | „ |

Dissolve the gelatine in the water with gentle heat, add the glycerin and pour the mixture slowly, with thorough mixing into the alcohol.

Thoroughly cleaned glass and unmounted photos, without printing or writing on the backs, must be used. [illegible] the solution in the glass and place the photo, face down, on the glass and [illegible] of the solution. Excess should be removed to prevent bubble formation. Allow to [illegible] the photograph when it is dry will be [illegible] and may be coloured if desired with oil paints.

### [illegible] FLEXIBLE LEATHER VARNISH

[illegible] varnish may be prepared as follows:

| | | |
|---|---|---|
| [illegible] | 100 | parts. |
| Gum sandarac | 25 | „ |
| Venice turpentine | 25 | „ |
| Pale rosin | 25 | „ |
| Castor oil | 20 | „ |
| Nigrosin (Spirit soluble) | 15 | „ |
| Methylated spirit | [illegible] | „ |

Place the ingredients in the methylated spirit and shake at intervals until dissolved. [illegible] strain through linen and bottle for use.

### NAIL ENAMEL

| | | |
|---|---|---|
| Acetone | 100 | lbs. |
| Butyl acetate | 200 | „ |
| Ethyl lactate | 200 | „ |
| Dibutyl phthalate | 100 | „ |
| Phenyl ethyl alcohol | [illegible] | fl oz. |
| Cellulose nitrate | 2[illegible] | oz. |
| Eosine (alcoholic solution) | q. s. | |

Dissolve the cellulose nitrate in a solution of acetone, butyl acetate, and ethyl lactate. Add the dibutyl phthalate and finally the phenyl ethyl alcohol and the colour solution.

When preparing the above articles be careful to have no flame near as some of the ingredients are very inflammable.

## —IN THE FIELD OF INVENTION

### IOTO-ELECTRIC CELL CONTROLS SHEET-FOLDING MACHINE

Of considerable interest to mill managements a recent application of the photo-electric cell control the folding of sheets. The equipment, stalled on the premises of James Bentley Ltd., Wilmington, Kent, and designed by Mr. K. ntley, a director of the company, is used to ntrol the folding of laundered sheets twice in e same direction, an operation which was pre- ously done by two girls but which is now done tomatically by the machine.

Each sheet is fed forward from an ironer to a number of parallel moving webbing belts. hen it has moved forward a few inches, the ading edge of the sheet intercepts a beam of ht falling on to an osram photo-electric cell d thereby operates a row of pneumatic grip- rs arranged across the path of the sheet. These ppers hold the leading edge of the sheet and se it slightly above the belts and, as the re- inder of the sheet is still moving forward, old is created. When the trailing edge of the eet uncovers the light beam, a relay mecha- m releases the gripper fingers and the two ges of the sheet fall together, a perfect fold ing completed.

The sheet then moves forward to a second oto-electric cell and gripper fingers and an- er fold is made in the same way. At this int the sheet is folded "long and narrow" and, the operator removes it from the folder, she es it the last transverse fold by hand. Altho- h this machine is used in this case for the ding of sheets, the same principle could easily applied to the folding of other textiles, paper, ther-cloth, etc.

A second application of the photo-electric l in this laundry is of particular importance the present time in that it results in quite stantial fuel saving. After the washing cesses, the clothes are passed through a dry- ; room heated by means of a steam radiator ed with a fan. A light beam is arranged to ojects across the room on to an Osram photo- ctric cell and, as long as the beam is obscured clothes passing around the room on the con- yor, the fan continues to run. If however, re is an interval between batches of work d the beam is unbroken, the photo-electric l stops the fan. This leads to a substantial p in the steam consumption of the radiator. en more clothes come along on the conveyor fan automatically restarts.

—TEXTILE RECORDER.

### IVERSAL WATER BATHS

Both large and small laboratories will reciate the advantages of thermostatic water hs which, when used with appropriate racks fittings, are suitable for a number of purposes. o standard sizes of baths cover the re- ements of the majority of laboratory tests.

The temperature range is from room temperature, or slightly below when the cooling unit is used, to 100 deg. C. Deviation can be thermostat working in conjunction with a hot- controlled within 0.5 deg. C. by a bimetallic wire vacuum switch. The tubular immersion heater, which is distributed evenly over the bottom of the bath, gives rapid response and uniform temperature distribution. Correct immersion for any test can be obtained by varying the water level and by adjusting the height of a strong perforated shelf fitted inside the bath.

—CHEMICAL PRODUCTS.

### NEW GLASS FILTERS

A new series of glass filters of Czechoslovakian manufacture have recently come into use, and a few practical details concerning them may therefore be of interest to those working in hygienic, analytical chemistry, etc.

"Sifrital" glass filters are of such a strength as to withstand an underpressure of 1 atmosphere under normal working conditions. They are available in five grades of porosity, the finest having an average pore diameter of from 5 to 15 microns; it is thus able to meet all requirements of the most minute analytical work.

These filters are manufactured of highly resistant "Sial" glass and therefore withstand most thermal, chemical and mechanical influences. They may be placed, without being preheated, in drying ovens e.g., with pads of "Sial" glass and exposed to temperatures up to 150 deg. C. It is advisable to filter alkaline solutions cold, while acids and even concentrated acids should be filtered at temperatures up to 300 deg. C. Without preheating, the optimum temperature is 110 deg. C. New filters should first be flushed with hot hydrochloric acid and water in order to remove impurities, dust and glass particles.

Sediments are removed from "Sifrital" filters by chemical means, and the final washing is done by flushing with tap water from the reverse side. To achieve perfect cleanliness suitable solvents are employed, such as carbon tetrachloride for fats, hot ammonia or hydro chloric acid for albumins, hot sulphuric acid with potassium dichromate or sodium nitrate and sodium chlorate for organic matter, hot hydrochloric acid and potassium chlorate for cupric oxide, hot nitric acid for mercury, and ammonia or sodium thiosulphite for silver chloride. Allighn tubes should be cleaned with hydrochloric acid and potassium chlorate.

Spare filters are cemented to their base by means of such cements as litharge, glycerin, sulphur, kaolin, water glass, zinc white.

"Sifrital" filters, which are particularly useful in minute analytical work, microbiology and microchemistry, are manufactured by Glassexport, Ltd. of Prague.

## WOODEN BATTERY SEPARATORS

**686 *N. C. B., Dacca*—Desires to know how wooden battery separators are made.**

**The separators, after manufacture, are given a chemical treatment to remove all the volatile acids, and to get rid of tannins and resinous matter as far as possible. The treatment consisted in boiling the separators in 1% aqueous solution of caustic soda for 2 hours, followed, by one hour's boiling in distilled water, with an intermediate washing to remove the colouring matter sticking to the separators. Lastly, the separators were thoroughly washed with the water till no trace of alkali was left. The separators were then fitted in the cells and made ready for test. The separators made of imported Port Orford cedar were used without any chemical treatment.**

**With Talauma phellocarpa, it was found that a second treatment in 1 % caustic soda solution was necessary in order to remove most of the colouring matter present in it. It was also noticed that, this second boiling in caustic soda solution, rendered the separators a little more flexible than when only one treatment was given.**

**The details of an alternative chemical treatment evolved by the Chemical Branch of the Forest Research Institute, are given in the following paragraphs. Batteries fitted with separators treated in this way are still under the test in the Seasoning Section. The improvement, if any resulting from this longer chemical treatment, will only be known after some time, and the results will be reported in a later publication.**

**"Separators made of the Indian timbers under test were boiled in 2 % aqueous solution of caustic soda for 3 hours, after which period, it was observed that practically the whole of the alkali had been neutralised, and that the colouring matter had not been completely removed from the separators. The separators were then removed from the hot solution, washed and again boiled in fresh solution of one per cent caustic soda for 2 hours. Except in the case of Adina cordifolia, the operation had to be repeated a third time (1 % caustic soda) with all the other species till the solution extracted no further colouring matter. The separators were then removed from the bath, washed in water and boiled repeatedly in distilled water, till the last trace of alkali was removed. These were then drained and superficially dried by interposing a blotting paper and pressing under a hand press. The separators were then given a dip in a bath of glycerine, to which had been added a small amount of an antiseptic (Rosha grass oil + thymol 2 : 1) at 105°—110°C for about 15–20 minutes. The separators, after draining off the glycerine, were washed in running water for a few minutes and stored, while wet, by wrapping in waxed paper.**

**In order that the treated separators may *retain sufficient* moisture, even after exposure in air, this glycerine treatment has been found necessary, otherwise they are liable to warp and crack on drying. This step, also, help to keep them flexible and preserves their pliability. The addition of essential oil is an antiseptic application in order to prevent fungus growing on the separators, while kept moist, in storage**

## HYDRAULIC BRAKE FLUID

I.

| | | |
|---|---|---|
| Glycerin | 50 | parts. |
| Diacetone erythritol | 50 | ,, |

II.

| | | |
|---|---|---|
| Sulphuric ether | 20 | oz. |
| Castor oil No. 1 | 20 | ,, |

Mix.

## CLARIFYING CASTOR OIL

To clarify castor oil mix *100 parts of the* oil at 95 F with a mixture of 1 part of alcohol (95 per cent) and 1 part of sulphuric acid. Allow to settle for 24 hours and then carefully decant from the precipitate. Now wash with warm water, boiling for 1 hour, allow to settle for 24 hours in well closed vessels, after which the purified oil may be taken off.

## TOOTH PASTE

*1111 I. M. S., Bareilly*—*Wishes to have a* recipe of tooth paste.

| | | |
|---|---|---|
| Precipitated chalk | 6 | oz. |
| Orris root (powder) | 1 | ,, |
| Magnesium carbonate (heavy) | 1 | ,, |
| Soap powder | 1 | ,, |
| Thymol | 10 | ,, |
| Eucalyptus oil | 20 | mins. |
| Methyl salicylate | 20 | ,, |
| Glycerin | 1 | oz. |
| Simple syrup | 1 | ,, |
| Water | 1 | q. s. |

Mix the glycerin, simple syrup and water. Next mix together chalk, *orris root*, and magnesium carbonate.

Now pour a sufficient quantity of the solution into the *mixing* machine. The powder mixture is next added gradually the right balance or consistency being maintained by the frequent addition of further quantities of excipient. When the paste is nearly finished add the mixture of thymol, methyl salicylate and eucalyptus oil. The soap is added last, when the cream will immediately become very soft. The "machine" is allowed to work until even distribution of all the constituents has been attained. The product is then forced through a fine sieve to remove grit or lumps of congealed soap, etc. As the paste contains a lot of air bubbles, it is allowed to stand a few hours and then filled in collapsible tubes.

**BATTERY ACID**

1147 H.S.M., Gulberga—Wants to have a process of making battery acid.

The electrolyte for accumulators must be of sulphuric acid of suitable densities depending on its ampere-hour discharge. The amount of solution or specific gravity of electrolyte, when the batteries are fully charged, should be about 1.190 to 1.225 at 60°F. for power station sells, though in motor car batteries densities of from 1.270 to 1.300 are often used. To prepare the acid solution of a particular density take a quantity of distilled water in a glass or glazed earthenware vessel of sufficient capacity, then gradually add the sulphuric acid stirring all the while with a clean wooden stick. Heat will develop due to the chemical action. Now allow the mixture to cool before pouring into the cells.

After cooling, the specific gravity will be found than while hot, and the careful addition of a little water may be necessary to bring the liquid to a proper density.

**LUSTRE POLISHING BAR**

1228 S.B., Moradabad—Desires to know formulas of making lustre polishing bar, etc.

| | |
|---|---|
| Tallow | 1 lb. |
| Red ferric oxide | 2 oz. |
| Oxalic acid | 3 dr. |
| Pumice powder | 2 oz. |

Powder the acid, mix with oxide and pumice powder. Then incorporate into the melted tallow. Lastly press the mixture in suitable moulds. The oxide and pumice must be quite free from grit, or it may produce scratches on the surface of polished metals.

**PEERLESS POLISHING STICK**

100 lb. oleo-stearine and 20 lb. of double-pressed stearic acid is placed in a kettle and melted by being brought to a temperature slightly above 130 degrees F.

To this hot mirture, add five lb. of triethanolamine and allow the resultant mixture to stand, while still hot, a sufficient time for thorough commingling and to enable the chemical reaction of saponification to be completed.

The above mixture is fed into a suitable mixing machine, which has been previously heated, and there slowly commingled with 220 lb. of tripoli powder and 180 lb. of powdered flint, this mixing operation generally requiring about one and one-half hours. The compound is transferred to suitable moulds in which it is allowed to solidify and harden into cakes of suitable size and shape for convenience in application to buffing wheels.



**JEWELLER'S ROUGE**

| | | |
|---|---|---|
| Green vitriol (crystals) | 50 | parts. |
| Nitrate of soda (pure) | 25 | " |
| Common salt | 13 | " |
| Sodium sulphate | 18 | " |

Pulverise the ingredients separately. Then mix the green vitriol, saltpetre and common salt, stir the mixture with water to a thin paste and boil down the mass in an iron crucible to dryness. Now heat the mixture thus obtained in a hessian crucible at a red heat until it becomes quiet and homogeneous. Then pour it out and when cool, powder, boil with water for a few minutes and wash. It is advisable to somewhat elutriate the powder thus obtained to eliminate grains of sand which may have reached it from the crucible. Finally collect the powder upon a cloth and dry.

**DOUBLE SULPHATE OF NICKEL AND AMMONIA**

The Double Sulphate of Nickel and Ammonium may readily be formed by dissolving oxide or carbonate of nickel in dilute sulphuric acid (1 part acid to 2 parts water). The resulting solution is then to be neutralised with ammonia and crystallised. To each pound of the dry crystals add 1 pound of pure sulphate of ammonia, dissolve the mixed salts, evaporate the solution and re-crystallise. Cube or grain nickel may also be dissolved in a mixture composed of 1 part sulphuric acid and 2 parts water, with the addition of a small quantity of nitric acid, moderate heat being applied as before. The solution is then to be evaporated and set aside to crystallise, and to convert the sulphate of nickel into the double salt, sulphate of ammonia is to be added in the same proportion as before; the mixed salts must be dissolved, filtered, and crystallised.

**ETCHING POWDER**

1235 R.K., Jullundur City—Wants to have a recipe of etching powder.

Etching powder for metals like tin, silver, iron, german silver, copper, and zinc may be prepared by mixing:—

| | |
|---|---|
| Blue vitriol | 1 part. |
| Ferric oxide | 4 parts. |

Mix. This mixture may be moistened and applied to the places to be etched.

**DRAGON'S BLOOD**

Dragon's blood is a kind of red resin obtained by evaporating the fluid which exudes out of freshly cut canes and rottans. This is however, for the most part prepared from the fruits of several species of calamas, met with in Eastern Sumatra, South Borneo and Penang. The gum exudes naturally from betweep the scales of the fruit, but inferior qualities are obtained by boiling the fruits or by tapping the stems.

### ARTIFICIAL MARBLE

**1335 K.M.T.F., Mohim—Wants to have a recipe of making artificial marble.**

**Alum, 1,000 parts; heavy spar, 10 to 100 parts; water, 100 parts; the amount of heavy spar being governed by the degree of translucence desired. The alum is dissolved in water with the use of heat. As soon as the solution boils the heavy spar is mixed in, stirred with water and the pigment; this is then boiled down until the mixture has lost about 3 per cent. of its weight, at which moment the mass exhibits a density of 34°Be. at a temperature of 212°F. The mixture is allowed to cool with constant stirring until the substance is semi-liquid. The resultant mass is poured in a mould covered on the inside with several layers of collodion and the cast permitted to cool completely in the mould, whereupon it is taken out and dried entirely in an airy room. Subsequently the object may be polished, patinized, or finished in some other way.**

### PREPARATIN OF COPPER SULPHATE

1337 B.L.T., Ambala Cantt.—Wishes to know the processes of manufacturing copper sulphate, etc.

I

Copper sulphate is also obtained by directly dissolving the metal in concentrated sulphuric acid; for this purpose copper and sulphuric acid are heated together. The metal is oxidised by a portion of the oxygen of the acid, while sulphurous acid escapes. The crude copper obtained by smelting the ore, and containing about 60 per cent. of metal is treated with sulphuric acid. The resulting solution is evaporated in leaden vessels and the clear liquid is left to crystallise in copper pans. From the mother liquor of the crystals, metallic copper is precipitated by means of iron, because the presence of a large quantity of iron sulphate renders this mother liquor unfit for vitriol. This method of obtaining copper sulphate is the least expensive but the salt is not quite pure.

II

If the copper scraps, turnings, borings, etc. are previously converted into copper oxide by exposure to a red heat, only half the quantity of sulphuric acid needed when the metal and the acid are heated directly, is required. On a large scale it is manufactured as follows.

Sheets or scraps of copper are heated to redness in a reverberatory furnace to the burning point of sulphur. A quantity of sulphur is thrown in. The furnace door and other openings are closed tightly, the effect being the formation of copper sulphide. After some time air is admitted into the furnace whereby the sulphide is converted by a comparatively low heat and the action of the oxygen into sulphate. The mass is next placed in a suitable vessel and as much sulphuric acid is added to it as is sufficient to saturate the oxide of copper. The clear solution, having been decanted from the insoluble residue is set aside for crystallisation.

### SODIUM CITRATE

**Sodium citrate is a crystallisable substance much used in medicine.** It is usually prepared **by neutralising a saturated solution of sodium bicarbonate with a saturated solution of citric acid. The sodium of the bicarbonate unites with the citric acid to form the sodium citrate, and the carbon dioxide gas escapes, producing effervescence.**

The resulting solution is directed to be evaporated to dryness. The mass is again dissolved in the least quantity of water and set aside to crystallise.

### MAGNESIUM SULPHATE

Magnesium sulphate may be obtained from dolomite or magnesium limestone. For this purpose the mineral, broken into fragments, is heated with a sufficient quantity of dilute sulphuric acid to convert its carbonates into sulphates, the sulphate of magnesium is washed out of the mass with hot water and the solution, after detection, is evaporated and crystallised.

### SODIUM ACETATE

Sodium acetate may be prepared by neutralising sodium carbonate with acetic acid. The solution thus obtained is evaporated and set aside to crystallise.

### EYE DROPS

1336 N.L.V. Muzafarpur—Wishes to have a good formula of eye drops.

| | | |
|---|---|---|
| Boric acid | 175 | grains. |
| Zinc sulphate | 44 | ,, |
| Sterilised water to make | 20 | fl. oz. |

Dissolve the solids in the sterilised water and then strain through a small plug of cotton wool. The first portion of the lotion may contain sediment and is therefore allowed to be strained again.

### STORAGE BATTERY PLATES

1334 K.R.D., Mundra—Desires to know a process of making storage battery plates.

A storage battery in its simplest form consists of two lead plates. The positive plate is coated with red lead, while the negative is covered with litharge. To coat the positive plate, prepare a stiff paste of red lead with dilute sulphuric acid. Ordinary commercial sulphuric

...id may be used for the purpose but it might ... diluted with water; about 2 parts of water ... 1 part of acid seems to be a good proportion ...r the acid commonly used. Concentrated ...id may be used with the addition of water, ...t in this case the plates will take a very long ...me to dry and harden, which is objectionable. ... coat the negative plate, similarly prepare ...paste of litharge with the sulphuric acid solu...on as prepared above. In pasting the plates, ...y them flat on a wooden board and rub the ...stes on the surface of the respective plate ...ith a spatula. After this set aside the plates ...ith edge upward in a warm place to dry and ...arden. From 12 to 24 hours, according to ...ze, are necessary for drying the plates ...oroughly.

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### ...OTOR CAR WAX POLISH

| | | |
|---|---|---|
| Carnauba wax | 120 | parts. |
| Kerosene oil | 50 | ,, |
| Stearic acid | 15 | ,, |
| Oleic acid | 3 | ,, |
| Benzaldehyde | 6 | ,, |
| Triethanolamine | 8 | ,, |
| Water to make | 825 | ,, |

Melt the carnauba wax, stearic acid and ...ic acid. Remove from fire and add the kero...ne oil and benz-aldehyde. Stir thoroughly. ...w add a hot solution (80°-85°C.) consisting ... 240 parts of water and the triethanolamine. ...ir well until a smooth emulsion is formed, ...en add sufficient hot water to make 825 parts. ...ntinue stirring until nearly cold; then bottle.

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### ...MAM.

1396 H.H.J., Vankaner -Wishes to have ... process of making kimam.

The principle underlying the manufacture ... kimam is almost the same as in the case of ...rti. The only difference to be kept in view ... that while surti is to be marketed in solid ...ndition, kimam is put on the market in the ...m of a thick liquid of various consistency.

Usually the water that is rejected after ...ating tobacco leaves in boiling water is made ... of in the composition of the kimam. The ...acco wash to be of any value to the manu...turers must be strong enough to impart to ... final product its characteristic taste and ...vour.

The leaves most suited for the preparation ... kimam are Hingli and Madras. But Rang...r leaves also yield a very good quality of ...nam. Usually 1 seer of leaf gives 1½ seers of ...nam.



Various kinds of spices such as cardamom major, cardamom minor, saffron, aniseed, coriander seed, etc., may be incorporated with the tobacco wash as flavouring agents may be used but in a particular preparation all these should not be jumbled up. Judicious selection of the ingredients alone can give a balanced product. The quantity of the spices to be added is a factor dependent upon the taste and requirement of the people for whom the article is meant. Addition of musk to the extent of 1 to 2 drs. for every seer of kimam also improves the flavour.

The spices are allowed to ferment in the tobacco wash. The proportion of the tobacco wash and the spices should be so adjusted that the product after the completion of the fermentation operation attains a syrupy consistency. Finally add natural ottos such as ottos of hena, patchouli, etc. just before packing.

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### METHYLENE BLUE

1416 K.L.M., Nagpur Desires to know formulas of preparing methylene blue, eosine, etc.

| | | |
|---|---|---|
| Dimethylaniline | 24 | grams. |
| Hydrochloric acid, conc. | 65 | ,, |
| Sodium nitrite | 7.1 | ,, |
| Zinc dust | 20 | ,, |
| Sodium thiosulphate | 50 | grams. |
| Potassium bichromate | 25 | ,, |
| Sulphuric acid, conc | 53 | ,, |
| Sodium chromate, neutral | 8 | ,, |

Dissolve 12 grams of dimethylaniline in a mixture of 40 c. c. of water and 65 grams of concentrated hydrochloric acid, and cool the solution with ice to 12°-15°C. Stir the mixture and slowly run in the sodium nitrite, taking care that the temperature does not rise above 15 C. The compound thus formed is next reduced by carefully adding the zinc dust, and the reduction is complete when the solution is of a clear red colour. The amount of zinc dust added must be sufficient to neutralise the hydrochloric acid, so that the blue litmus paper is no longer turned red. The solution is now diluted with water to 500 c.c. and a solution of 12 grams of dimethylaniline in the exact quantity of hydrochloric acid necessary to form the hydrochloride added, and then a solution of 50 grams of sodium thiosulphate in a little water.

Then oxidise the mixture by adding a concentrated solution of 25 grams of potassium bichromate and boiling for 2 hours.

Now pour the sulphuric acid being diluted with 100 c.c. of water and boil so as to expel sulphur dioxide formed in the reaction.

Next oxidise the leuco-methylene blue by adding the neutral sodium chromate dissolved in a little water and precipitate the resulting dye by the addition of salt.

Again, filter the base, dissolve it in a little boiling water to which a little hydrochloric acid has been added and again precipitate by con-

## —READER'S BUSINESS PROBLEMS

[ **Reader's business problems will be discussed in these pages. We invite the reader to write** **s his difficulties. As the department is in charge of an experienced businessman who is** **pecially adept in dealing with such problems and to whom experiences of a large number** **f successful businessmen are available, his replies will lead the enquirer to a successful** **areer. These replies will be published in the paper only and cannot be communicated by** **ost.]**

### VRITING FOR THE PRESS

349 P.L.D., Burdwan—Wishes to be en-ghtened on how to write for the Press.

It is a matter of extreme difficulty to lay own rules for successful writing for the 'ress, since the qualities that make a man a relcome contributor to political paper will robably debar him from the columns of finan-al and economical paper. But all news-apers and periodicals have one thing in ommon. Their space is arbitrarily restricted nd therefore the writer who fills a page with hat can be adequately said in a sentence can ot hope for popularity with editors.

There is an obvious difference between the ecessary qualifications of the man who reports nd of the man who comments. The reporter ust have very alert eyes. He must be able to ee more than the average man, and if he has is acute sight, the measure of his understand-ng is a matter of comparative unimportance. Ie must, too, have detachment. Prejudice and nthusiasm both affect observation.

Outstanding success in writing for the 'ress, almost equally with other writting de-ends on personality.

But while there is, on every newspaper taff, a small number of "star" writers who are mployed because of their own individual ualities, most of the columns are filled by men ith the capacity for concise description, written ith a certain sense of style, who may be relied n for accuracy and a propriety, which I am ound to add is esteemed far more highly in ome offices than it is in others.

The commentator- the writer of leading rticles and of literary, dramatic and artistic riticism—must also possess the same capacity or concise expression, with a sense of style nd a knowledge which must be wide, but need ot be very deep. The newspaper writer must earn how to use books of reference, must now where to find his facts and where to put is hand on the apt quotation. And I certainly ecommend the aspirant to collect anthologies. They save a world of time.

### METHODS OF EXPORTING GOODS

1342 P.C., Bombay -- Requests us to des-ribe the methods of exporting goods.

When an order is received for sending goods to a foreign country it is ordinarily known as an indent and it contains particulars about the order and the terms and conditions for its execution. Amongst others it usually contains the following particular detailed des-cription of the goods required, the rate of price, shipping and packing instruction, rate of valua-tion for insurance purposes, the date of ship-ment and the terms of commission, etc. There-after the exporter places order with manufac-turers, wholesale dealers or producers, etc. whom he considers able to supply one or more items of goods mentioned in the indent, or ask for quotation from them. Then he sends inti-mation to the foreign merchant confirming the order given in the indent. The instruction for packing, forwarding will be given to the suppliers. These contain directions regarding the marks and numbers to be put on the cases, and the name of the port, dock or station where they are to be sent mentioning the ship by which they are to be shipped, and their ulti-mate destination. In packing and marking particular care should be taken according to the nature of the contents. When the goods are loaded invoices are prepared giving the name of the vessel and the marks and numbers of the cases together with the charges for cases, cartage, freight, primage, bill of lading, dock charges and insurance charges. When the goods are placed on board the ship, the bills of lading in triplicate are prepared and signed by the master of the ship. They are also to be stamped. Thereafter they are handed over to the shipper of the goods. Each of them contains the names of the ship and the shipper, the place of loading and destination, the description of the goods together with their weight and freight charges, the name of the person to whom the goods are to be delivered. When the goods are actually loaded, the shipper gets a mate's receipt for the goods thus loaded. The bills of loading are received by him from the officer in exchange for the mate's receipt.

One invoice, one of the bills of lading together with the insurance policy covering the goods, if any, are sent by post to the con-signee so that they may reach him before the arrival of goods. It is also customary to send duplicate copies of the same by the next mail again, to the consignee so that if the invoice, bills of lading, etc. sent previously be miscar-ried the consignee may be put to any difficulty. The triplicate copy of these documents are kept by the shipper with himself.

The consignee on receipt of all these docu-ments compares the details contained in them with the details of the order placed by him in order to see that the order has been strictly complied with.

## —BRIEF QUERIES AND REPLIES

**Questions of any kind within the scope of Industry are invited. Enquiries or replies from ou experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters**

**1133** C.R.R., Bangalore City—Processes of manufacturing brake fluid, neo cellulose thinner and clarifying castor oil appears in this issue.

**1136** S.N.W., Sattur—Process of electroplating stainless steel will appear in due course.

**1137** P.B.L., Mathura — Needle making machines may be had of Baird Machinery Co., Bridgeport, Connecticut, U.S.A. Wire may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta.

**1138** K.P.S., Jabalpur — Bengal Satifood may be had of Amulya Dhone Paul & Co., 113, Chengrapatty Street, Calcutta. Shrimany's palm sugar candy may be had of Sugar Candy Factory, 4, Vivekananda Road, Calcutta.

**1139** C.D.S., New Delhi—You may stock medicines at your home and supply to dealers who want. Afterwards when you will get a suitable room on moderate rent you may start a shop. You should select only those common medicines that are always in good demand. In this way you may expand your businesss from a small beginning.

**1140** A.S., Ajmer—For goggles and optical goods enquire of Eastern Optical Co., 306, Bowbazar Street, James Murray & Co. Ltd., 5, Old Court House Street and New Indian Optical Co., 57-3, Bow Bazar Street, all of Calcutta. Fountain pens may be had of F. N. Gooptu & Co., 2, Belliaghata Road; G. C. Law & Co., , Cornwallis Street and Bharati Works, 22, Canal South Road; all of Calcutta. Fountain pen nibs and other materials may be had of the above firms.

**1141** M.A., Madras—Reply to your query appears under No. 1086 above.

**1142** B.R.S.S., Ludhiana—For transfer labels enquire of R. G. Paul & Co., 110/2, Grey Street, Calcutta and Signograph Co., 208, Gopal Lal Thakur Rd., Baranagore, Calcutta.

**1143** N.H., Siwan—For semai machine enquire of Oriental Machineries Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

**1144** P.M.S., Bareilly — Formula of tooth paste appears elsewhere in this issue. Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta Tube filling machine may be had of International Trading Co., 13, Netaji Subhas Road, Cal

**1146** O.R., Rohtak Mandi—Plastic machine may be had of Small Machineries Mfg. Co., 22 R. G. Kar Road; Francis Klein & Co. Ltd., 1 Royal Exchange Place and Alfred Herbert (India) Ltd., 13/3, Strand Road; all of Calcutta Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

**1147** H.B.M.C., Gulberga—Process of recharging storage batteries will appear in due course.

**1152** R.C., Kanpur—You perhaps mean vacuum packing machine which may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

**1153** A.T.P., Delhi—You should use Darjeeling or Dooar's tea for producing good flavour to ever ready tea.

**1154** B.N.D., Calcutta—Addresses of chalk pencil manufacturer and tailor's chalk manufacturers quoted by you are complete; you may communicate with them direct.

**1157** K.D.K., Dhandhuka—You may send article on fruit canning and preserving and if approved by our Editorial Board will be published in Industry.

**1163** K.S.M., Cuttack—We are not aware of any University or College where practical training is given on plastic industry.

**1164** J.W.K., Batala—For pin, nib and needle making machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

**1165** B.D., Longai — Transfer pictures may be had of R. G. Paul & Co., 110/2, Grey Street and Signograph Co., Baranagore; both of Calcutta. Fret work is done by means of fret working machine which may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. You may consult Indigenous Drugs of India by R. N. Chopra.

1172 S.L.D., Jhansi—Formulas of snow and vanishing cream appeared in April, 1950 issue of Industry.

1173 K.B.R., Vizianagram—For bakelite caps enquire of the following firms:—India Moulding Co., C-2, Bharat Bhawan, 13, Chittaranjan Avenue; National Moulding Co. Ltd., 26, Upper Chitpur Road and Radha Bazar Bottle Stores, 15, Radha Bazar Lane; all of Calcutta. Tin printing is undertaken by Bengal Tin Box Mnfg. Co. Ltd., 1, Jadu Mitra Lane, Calcutta; National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street, Calcutta and Metal Box Co. of India Ltd., B2, Hide Road, Kidderpore, Calcutta. Labels may be had of Sikri & Co., 55, Canning Street, Calcutta. Collapsible tubes may be had of Metal Box of India Ltd., B2, Hide Road, Kidderpore, Calcutta. You may use denatured spirit in ink.

1174 S.S., Nagpur—For match splints and veneers you may enquire of the following firms: Amrit Match Factory, Kargi Road, Bilaspur; Madras Match Works Ltd., 42, Gollawar Agraharam Road, Tondiarpet, Madras and Anakapalli Match Co., Anakapalli, Vizagapatam.

1176 V.M.L., Cranganore—We have no book on film industry. For cinema machines enquire of Britania Talking Machine Co., 194, Dharamtalla Street, Calcutta; Eastern Electric & Engineering Co., 127, Mahatma Gandhi Road, Bombay 1 and International Talkie Equipment Co., 17, Queen's Road, Bombay.

1178 S.K.B., Kaliashahar Oxalic acid and gallic acid may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. Aniline blue, naphthol black, etc. may be had of Fuzlehussein & Bros., 44, Armenian Street and Champalal Agarwalla, 45, Armenian Street; both of Calcutta.

1179 K.D.B.C., Mandsaur—Following is a list of cement factories: Rohtas Industries Ltd., Dalmianagar, Dehrion Sone Dt., Shahabad; Sonevalley Portland Cement Co., Ltd., Japla; Sahabad Cement Factory, Hyderabad; Katni Cement Industrial Co. Ltd., Katni; Patiala Cement Co. Ltd., Surajpur; Pahala State and Lakheri Cement Works Ltd., Lakheri, Saurastra. Complete list of cement factories will be found in Industry Year Book & Directory published from this office, price Rs. 16/1/- including postage. In order to remove rancidity of old ghee boil the ghee with lemon leaves and raw turmeric.

1181 K.R.S., Rayadrug—For gunny enquire of the following firms:—Bholaram Motilal, 72, Cotton Street; Das Brothers, 29, Strand Road and Pioneer Bag Co., 15, Netaji Subhas Road; all of Calcutta. Carpets may be had of C. M Hadow & Co., Srinagar, Kashmir; Kailash Carpet Factory, Srinagar, Kashmir; Indian Carpet Corporation, 30, Chittaranjan Avenue, Calcutta and Carpet Stores, 7 & 11, Lindsay Street, Calcutta. You may have the plant locally.

1182 B.C., Ahmednagar—For radio receivers of required brand enquire of K. C. Dey & Sons, 161-1, Harrison Road; Phillips Electrical Co. (India) Ltd., 2, Heysham Road and General Radio & Appliances Ltd., 10, Old Court House Street; all of Calcutta.

1184 S.C., Habarane—For tools required enquire of Subol Dutt & Sons Ltd., 13, Brabourne Road, Calcutta; and Vickers Eastern Ltd., 19, British Indian Street, Calcutta.

1186 M.G., Tinsukia Botanic name of chaulmoogra is hydnocarpus inebrians and in ayurved system it is known as chaulmoogra. Formulas of ink will be found in April 1950 issue of Industry.

1189 G.M.B., Gadag Following is a list of glass factories in Calcutta: Artistic Glass Works, 2, Tagore Castle Street; Asiatic Glass Product, 30B, Sahitya Parishad Street; Burma Glass Works, 9, Ezra Street; Hind Glass Works Ltd., 35, Chittaranjan Avenue and Krishna Silicate & Glass Works Ltd, 17, Radha Bazar Street. Full list of glass factories will be found in Industry Year Book and Directory published from this office, price Rs. 16/1/ including postage. Following is a list of pottery manufacturers: Bengal Potteries Ltd, 45, Tangra Road; Calcutta Potteries Ltd, 8, Lyons Range; Hindusthan Potteries, 12, Shib Kristo Daw Lane, Orient Potteries Ltd, P16, Mission Row Extension and Reliance Firebrick & Pottery Co. Ltd, 8, Clive Row, all of Calcutta.

1190 S.K.R.K.R.S, Moradabad You may use extra hard paraffin wax 1 lb. and ½ lb. tallow in the formula of lustre polish.

1193 H.R.S., Narsapur - Process of manufacturing all sorts of ink will be found in Manufacture of Ink published from this office, price Rs. 3/9/- including postage.

1197 A.G.M., Vaniyambadi -For tanning chemicals write to Calcutta Chemical Co. Ltd., 10 Bonfield Lane, Calcutta; Allied Agency, 16, Bonfield Lane, Calcutta and Banshidhar Dutt, 126, Khengrapatty Street, Calcutta

1199 V.N, Delhi Acid colouring bath means a solution of acid colour to be used in dyeing. Sometimes some salts are required to make the colour fast.

1203 M.A.S, Lahore We have no book on flour milling industry. For letter enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and Standard Literature Co. Ltd, 13/3, Old Court House Street, Calcutta.

1204 K.R., Salem Jn. -We cannot publish notice of ballot box invented by you without seeing its usefulness.

**1205 T.R.V.K.S., Mysore—To produce gloss to soap use 5 p. c. castor oil.**

**1206 R.K.D., Vengurla—Process of refining and deodorising coconut oil, groundnut oil and castor oil will appear in due course.**

1207 S.D.C., Truchiarapalli—For celluloid sheets enquire of A. K. Zainuddin & Co., 122, Bhindi Bazar, Mohamad Manzil, Bombay 3; Kundanmal Ramlal, Sewri Bldg., 78-80 New Hanuman Lane, Bombay 2 and Swadeshi Industries Ltd., 100, Netaji Subhas Road, Calcutta.

1208 P.S.B., Mysore—You should use vacuum packing machine, for making sweetmeat tins airtight. Vacuum packing machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1209 R.S.C., Agra—Process of chromium plating will be found in Electroplating in Practice published from this office, price Rs. 3/9/- including postage.

1210 C.R.R., Bangalore City — Process of manufacturing artificial leather cloth will appear in due course.

1211 S.C., Habarana—Detailed process of manufacturing casein moulding powder follows after the general process. You should try the detailed process as given.

1212 H.B.H., Simla—Mixing and kneading machines may be had of Prabartak Commercial Corporation Ltd., 61, Bowbazar Street, Calcutta and Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

1213 D.O., Gwalior—For British Pharmacopia enquire of Das Gupta & Co., 54-3, College Street, Calcutta.

1216 V.G.S., Cochin—For books on palmistry write to D. B. Taraporevala Sons & Co. Ltd., Taj Bldg., 210, Hornby Road, Bombay; D. A. Nadkarni & Co. Ltd., 22, Tank Road, Bombay 26; Gurudas Chatterjee & Sons, 203-1-1, Cornwallis Street, Calcutta and Dey Brother, B47, Sir Stuart Hogg Market, Calcutta.

1218 D., Kanpur—For books on embroidery designs write to Gurudas Chatterjee & Sons, 203-1-1, Cornwallis St., Calcutta; Wachel Molla & Sons, 6, Dharamtala Street, Calcutta and L. Mullick, Wool House, 183, Dharamtala Street, Calcutta.

1219 S.M.Y., Trichniopoly—Following is a list of newspapers: Ettalast; Iran; Armaghan; Omid and Setareh issued from Teheran, Persia.

1225 A.N.M., Banaras—You may start mail order business with small capital. You may also go through Reader's Business Problems Section.

1227 P.V.G., Alleppey—Following is a list of used stamp dealers: Ghosal & Co., 85, Tantipara Lane, Santragachi, Howrah; Stamp Mart 1 3, Dharamtala Street, Calcutta and Stamp Centre, 10, Chowringhee, Calcutta.

1228 S.B., Moradabad—Formulas of lustre peerless etc. appear elsewhere in this issue.

1229 B.M.S.S.W., Bombay — For required hydrometer enquire of Adair Dutt & Co. Ltd. Stephen House, 4 & 5, Dalhousie Squar, Calcutta

1231 J.N.C., Bogra—It is not possible to deodorise methylated spirit. You may use carnauba wax to shoe polish. As regards tara alta you may use glue or gum arabic to make alta bright and glossy.

1232 J.B., Gadag—For plastic signboard and nameplates enquire of Gem & Co., 325, 326 China Bazar, Madras.

1233 E.B., Erode—Chemicals may be had of Parry & Co. Ltd., Chemical Dept., Dare House Post Box No. 12, Madras; P. R. Pillai & Co 36, Venkatachala Mudaly Street, P. T., Madras and Premier Indian Scientific Co. Ltd., 1-33 Varadarajalu Naidu Road, Egmore, Madras.

1234 R.K.S., Sibsagar—For tobacco cutting machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1235 R.K.S., Jullundur City—Process of manufacturing etching powder, dragon's blood appears elsewhere in this issue.

1236 A.P.C.S., Calcutta—Process of silvering glass appeared in April, 1950 issue of Industry.

1237 S.R.M., Kumbakonam—Please write in English.

1238 A.P.J., Rohtak—Safety pin and hair pin making machines may be had of Baird Machinery Co., Bridgeport, Connecticut, U.S.A

1247 P. R. K., Banaras City — Weaving accessories may be had of Apollo Engineering Co., 84, Apollo Street, Fort, Bombay; H. M Mehta & Co., Apollo Street, Fort, Bombay and Hindusthan Loom Co. Ltd., 5, Bank Street Fort, Bombay.

1249 P.P., Banaras—Address of Sen & Co is 37, Moti Sil Street, Calcutta 13.

1251 D.I.U.C., Ujjain — Addresses other than those already published in Industry Year Book and Directory are not available.

1254 T.R.S.L., Madras—For ruby red glass enquire of United Provinces Glass Works Ltd Bijnor, Moradabad, U.P.

1256 H.G.A., Orai — Distilling apparatus may be had of Adair Dutt & Co. Ltd., Stephen House, 4 & 5, Dalhousie Square East, Calcutta Ointment pots of plastic may be had of Nute (India) Ltd., Deokaran Mansion, Princess St Bombay and Plasto Metal Moulding Co. of India

Bombay 1.

**1258 P.N.C., Anakapalle—We have no book on mantle manufacture. An article on mantle manufacture appeared in December, 1949, issue of Industry.**

**1262 G.R.B., Kurdwadi—Following is a formula of imitation gold: Copper 90 parts; gold 2½ parts; aluminium 7½ parts. Melt the copper and the gold in a crucible composed of refactory materials or of a mixture of unburnt fire clay and dust of firebricks, glass pots or seggars and when the metals are fluid the aluminium is added. When not more than 2 lbs. of the alloy are made at a time the mass is kept in a fuse state for half an hour about 1¾ oz. of borax being added as a flux. The melted mass is then poured into ingots.**

1264 K.C.W., Agra—Plastic machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta.

1265 H.S., Howrah Process of manufacturing pencil will be found in Industry Prize Articles Vol. 1 published from this office, price Rs. 2/- including postage.

1269 S.N.W., Sattur—You may use nitric acid for etching iron.

1270 N.K.S.W.M.U., *Srinagar—Crown cork* may be had of Crown Cork Manufacturing Co., 1, Uma Kanto Sen Lane; Ghughudanga, Calcutta.

1274 G.V., Surat—You may take agency of goods manufactured by Bengal Chemical & Pharmaceutical Works Ltd., 164, Maniektala Main Road; Bengal Immunity Co. Ltd., 153, Dharamtala Street and Calcutta Chemical Co. Ltd., Pandlitya Road; all of Calcutta.

1275 C.A.G., *Dehra Dun For plants* of mango enquire of Globe Nursery, College St., Market, Calcutta; National Nursery, 46, Ramdhone Mitra Lane, Calcutta; Kumaun Nursery, Ramnagar, Nainital and Dass Nursery & Flower Garden, Rai Bahadur Road, Behala, Calcutta

1277 P.J.P.R.C., Vellore -For washing oil dissolve 1 part salt in 100 parts water and use this. Quantity should be half the quantity of oil to be washed. Then make a solution containing 1 part sodium bicarbonate in 100 parts water and use this solution for washing oil. For diesel oil engines enquire of the following firms: Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; Bombay Co. Ltd., Pollock House, Pollock Street: Heatly & Gresham Ltd., 6, Mission Row Extension; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road and National Engineering Co., 379, Netaji Subhas Road; all of Calcutta.

1278 M.A.N., Nagpur—Process of manufacturing white paint will appear in due course.

1279 C.J.D., Tuticorin—Dip the yarn in a strong solution of alum and carefully dry it. For preserving fishing net for 40 parts of net 3 parts of cutch; 1 part of blue vitriol; ½ part of potassium chromate and 2½ parts of wood tar are required. The kutch is boiled with 150 parts of water until dissolved and then the blue vitriol added. Next the net is entered and the tar added. The whole should be stirred well and the net must boil 5 to 8 minutes. Now take out the netting lay it in another vessel, cover up well and leave also for 12 hours. After that is dried well spread out in a clean place and coated with linseed oil. Not before 6 hours have elasped should it be folded together and put into the water.

1281 K. L. G., Kargi Road - For selling beedies in Burma, Java, etc. advertise in newspapers of those countries.

1284 P.G., Dhakuria Formula of ordinary taral alta given at last of all formulas of taral alta will be good and at the same time cheap.

1287 M.L.P., Colombo We have no book on export trade of Ceylon. You may consult Ceylon Trade Journal issued by the Department of Commerce, Colombo, Ceylon.

1288 H.C.N., Purulia For power looms enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta; M. L. Chatterjee & Sons, 4, Commercial Bldgs., and Britannia Engineering Co. Ltd., 28, Dalhousie Square; all of Calcutta. For details you may negotatiate with the firms direct.

1289 P.T.J., Tezpur - Confectionery machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

1291 J.K.B., Bombay Following is a list of match manufacturers: Islam Match Factory, Ahmedabad; Kankaria Match Factory, New Kankaria Tank, Ahmedabad; New Cambay Match Factory, Cambay, Kaira, Western India Match Co. Ltd., Alambazar, Near Calcutta; Pioneer Match Factory, 16, Dum Dum Road, 24 Pargs. and Hydari Match Co., 150A, Belliaghata Main Road, Calcutta. Fire works may be had of Orient Fire Works Co., 175B, Upper Circular Road, Calcutta; Jai Hind Fire Works, Karim Chambers, Hamam Street, Fort, Bombay.

1293 M.A.A.S., Virginia -Particulars of saw dust are not known

1294 L.L., Chaibasa -The *treatment of* walls which are to be painted in flat colours is to prime with a thin coat of lead and oil well brushed into the wall. Next put on a thin coat of glue size; next a coat mixed with ½ oil and turpentine, next a coat of flat paint mixed with turpentine. If you use any dry pigment mix

... oil and thin with turpentine. If, in ... case the paint dries too fast, and is ... to show laps, put a little glycerine in, ... retard the drying.

1295 Y.L., Shivpuri—We have no book on ... For laundry machine enquire of ... & Co. Ltd., 93, Netaji Subhas Road, Calcutta and Phoenix Machinery Agency, Gordhan ... 4th Lane, Khetwadi, Bombay.

1296 F.C., Bombay — Saffron may be had ... Bhan Brothers Ltd., Srinagar; Fairways, ... O. Box No. 51, Srinagar, and Kashmir Honey ...ores, Udhampore; all of Kashmir.

1297 R.K.C., Lashkar—Process of making ...emical barometer will appear in due course.

1298 H.K.M.R., Holur—We have no book ... paper manufacture. For a book on paper ...anufacture enquire of Thacker Spink & Co. ...933) Ltd., 3, Esplanade East, Calcutta.

1300 J.R., Transvaal—For jeweller's tools ...quire of Hamilton & Co. Ltd., 8, Old Court ...ouse Street, Calcutta and Jem & Co., 10, Old ...ourt House Street, Calcutta. Please write ...early what particular formula you want ...hen we shall supply the formula.

1301 K.S.N., Moyar Camp—For electrode ...aking machine enquire of Balmer Lawrie & ... Ltd., 103, Netaji Subhas Road and Francis ...lein & Co. Ltd., 1, Royal Exchange Place; both Calcutta.

1303 G.S., Amritsar—To make artificial ...eth grind felspar and quartz to an impalpable ...owder together with a certain amount of kaolin. ...en make the mixture into a thick paste with ...ater and tint in a variety of colours by means ... titanium dioxide or by the use of salts of ...balt, uranium, manganese, etc. Next press ...e paste in moulds in which are inserted pla...num pins. Then burn the teeth in saggers ...til well vitrified a temperature of about 48°C. ...ing required. They are then covered with ... enamel made of the same materials as the ...dy of the tooth, but mixed in slightly differ...t proportions.

1309 G.C.T.C., Allahabad—All the ingredi...ts may be had of Banshidhar Dutt, 126, ...aengrapatty Street, Calcutta. Process of mir...r making will be found in Small Industries ...blished from this office, price Re. 1/8/- includ...g postage. For hair clip making machine ...quire of Oriental Machinery Supplying ...gency Ltd., P12, Mission Row Extension, ...lcutta and Baird Machinery Co., Bridgeport, ...nnecticut, U.S.A.

1311 H.S.O.M., Ambala City—Soap making ...uipments may be had of Small Machineries ...fg. Co., 22, R. G. Kar Road, Calcutta. Soap ...aterials may be had of Calcutta Mineral Supply ... Ltd., 31, Jackson Lane, Calcutta.

1312 G.R.S.I., Bhiwani—Addresses of Glass ...anufacturers Association and Rubber Manu...facturers Association are not known.

1316 N.J.V., Murtazapur—You may start ...anufacture of penholders and foot rules, etc. ...th Rs. 5,000/- to Rs. 10,000/-. You may start ...anufacture of fountain pen ink with Rs. 500/- ... a very small scale. A recipe of scorpion bite ...re will appear in due course.

had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

1320 S., Lucknow—Leather colouring and polishing process will appear in due course.

1324 K.R.D., Mundra—Process of storage battery manufacture and motor body polish appears elsewhere in this issue.

1325 S.R., Babathsingala—If you distill the toddy you may preserve it in bottles.

1326 Q.M.A., Hinganghat—Glass eyes for preserved dead animals may be had of P. Basak & Co., 9, Chidam Modi Lane, Calcutta.

1329 U.S.J., Jodhpur—For bleaching oil you have to use animal charcoal which should be 5 to 10 per cent. according to the quality of the oil. Sajji is used for bleaching oil.

1330 M. P. G., Dhampur — For taking agency of kerosene oil and other oils you may negotiate with the following firms: Adamji Lookmanji & Co., 35, Bapu Khote Street, Null Bazar, Bombay; Dadar Kerosene Depot, Palija Mansion, Vincent Road, Bombay and Harbox Gopiram, 26, Burtolla Street, Calcutta.

1334 P.K., Kumabakonam — Formula of distemper appeared in March, 1951, issue of Industry.

1335 K.M.T.F, Mahim — For tile making machines enquire of Martin Burn Ltd., 12, Mission Row, Calcutta, and Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta. Process of manufacturing improved tiles appears elsewhere in this issue.

1336 S.K.G., Raigarh—You may negotiate with the following firms for taking agency: Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Road; Calcutta Chemical Co. Ltd., 35, Panditia Road and Bengal Immunity Co. Ltd., 153, Dharamtala Street, all of Calcutta.

1337 B.L.T., Ambala Cantt.—Formulas of copper sulphate, magnesium sulphate, etc appears elsewhere in this issue.

1338 S., Lucknow—For cycle seat leather you should use stiff leather of the type of saddle leather.

1341 U.C., Jamnagar — In manufacturing ayurvedic preparations you should always use genuine herbs and drugs and in no case substitutes should be used. Raw materials will be available from dealers in indigenous herbs and drugs. You should always use attractive labels and packing should be done very carefully and artistically. As regards publicity you may advertise in newspapers and periodicals and also distribute handbills and placards in the towns where you have agents or representatives. You may appoint agents in big towns of India, Viz: at Delhi, Calcutta, Madras and Bombay. These agents should be given power to appoint sub-agents who will work in co-operation with the agents.

1342 R.G.S., Agra — Envelope making machine may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. As regards paper you may buy from market.

1343 G.C.T.S., Allahabad — There is no arrangemene for giving practical training on

1346 V.K.B., Singanallur—Citric acid B. P. [illegible] citric acid manufactured by British harmacopea Process and Standardised.

1348 S.B., Delhi—For gunny bags enquire ' the following firms: Bholaram Matilal 2, Cotton Street; Calchtta Hessian Exchange, 3-2, Netaji Subhas Road; Das Brothers, 29. trand Road, and Fool Chand Sarawgie, Clive ow; all of Calcutta.

1349 M.N.H., Mysore—Formulas you want 'ill be found in Small Industries published 'om this office, price Re. 1/8/- including ostage.

1353 N.S., Kanpur — We have no book on 'ater proofing canvas and rolling mill industry 'rocess will appear in due course.

1355 G.M.S.C., Gwalior — For ball bearing nachines enquire of the following firms: Guest Keen Williams Ltd., Construction House, Ballard Estate, Bombay; Heatly Gresham Ltd., , Forbes Street, Fort, Bombay; M. H. Dinshaw & Co., 105-106, Apollo Street, Bombay, Mather & Platt Ltd., Bruce Street, Fort, Bombay; Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta; Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta; Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Martin Burn Ltd., 12, Mission Row, Calcutta.

1357 D.R.K., Jullundur City — Industry is the only journal of its kind in India. There is no other journal like Industry.

1358 R.I.W., Akim Swedru Present whereabout of Lahore University is not available.

1359 T.T.W.C., Allahabad — You may consult Manufacture of Toilet Goods published from this office. price Rs. 4/9/- including postage. For books on radio enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

1360 S.T., Raipur — Process of mirror making will be found in April, 1950, issue of Industry.

1361 J.C., Kanpur—We are not aware of any hypnotist or mesmerist who will teach you hypnotism and mesmerism practically.

1362 S.P.C., Singapore—You should communicate direct with the querist care of Industry when your letter will be duly redirected.

1363 H.L.B., Agra—Following is a list of bristle merchants: Jai Bharat Brush Co., 278, Soparibaug Road, Parel, Bombay; Indian Bristles & Lard Supply Co., 31-1, Tangra Road, Calcutta; S. Mazumdar, 67B, Netaji Subhas Road, Calcutta and Volkart Bros., Armenian St., Madras. Process of bleaching bristle will appear in due course.

1364 I.A., Colombo—Bottles may be had of Bimal Bottle Stores, 130, Radha Bazar Street, Radha Bazar Bottle Stores, 15, Radha Bazar Lane and S. P. Singha & Co., 4, Ezra Street; all of Calcutta. Labels may be had of N. De & Co., 1, Bhim Ghose Bye Lane, Calcutta and Bharat Laxmi Press, 92, Princess Street, Calcutta.

1365 N.D., Srimangal — Lozenge making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road. Calcutta.

1369 S.L.B., Calcutta — Manufacture of wood screw on small scale will not be very profitable. Machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta. As regards raw materials you have to secure from second hand dealers.

1370 A.A.N., Vellore Process of utilising used storage battery plates will appear in due course.

1380 M.W.L., Aijal—Shoe making tools may be had of A. C. Mohamad, A. C. House, P16, Bentinck Street, Calcutta. Plywood may be had of Hindusthan Corporation, 29, Strand Rd., Calcutta and Khaitan Sons & Co. Ld., 2, Dalhousie Square East, Calcutta. Rickshaws may be had of Bengal Cycle Rickshaw Works, 13, Sun [illegible] East Road and H. D. Nundy & Co., 50 6, Dharamtala Street; both of Calcutta. Carpenter's tools may be had of Bengal Hardware Store, 165, Chandney Chowk; Calcutta Hardware Store, 137, 138, Chandney Chowk, Calcutta and Imperial Hardware & Co. 186, Chandney Chowk, Calcutta. Enamel may be had of Sur Enamel & Stamping Works Ltd., 9, Middle Road, Entally, Calcutta and Calcutta Tin Can & Enamel Works, 72, Tiljala Road, Calcutta.

1383 R.K.T., Bhagwantnagar—Refer your query to Homoeopathy State Faculty, West Bengal, 1B, Old Post Office Street, Calcutta.

1386 M.A., Madras We do not understand what you mean by ball point ink. If possible please supply sample of the ink when we shall try to supply you the formula.

1389 L.M., Bhawanimandi Tin plate is manufactured by Tinplate Co. of India Ltd., Jamshedpur, Bihar. Following is a list of paper manufacturers: Bengal Paper Mills Co. Ltd., 21 Netaji Subhas Road, India Paper Pulp Co. Ltd., 8, Clive Row, and Titagarh Paper Mills, Chartered Bank Bldg., all of Calcutta. Matches are manufactured by Brahmaputra Match Works Ltd., 19, Bartollo Street; Esavi India Match Mfg. Co., 17, Muraripukur Road; Hodari Match Co., 170A, Belliaghata Main Road and Western India Match Co. Ltd., Alambazar, all of Calcutta.

1393 K.M.S., [illegible] For salammoniac bars and tablets enquire of Bengal Chemical & Pharmaceutical Works Ltd., 164, Maniktala Main Road and Calcutta Chemical Co. Ltd., 35, Panditia Road, Ballygunge, both of Calcutta.

1395 D.C.B., Ahmedabad — We have no book on envelope manufacture. Envelope making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1396 H.H.J., Vaniyamba[illegible] Process of manufacturing scented betelnut chips will appear in due course.

1397 Y.V., Nellore For chemical plants enquire of Chemical Plants & Equipment Ltd., 7, Lower Chitpur Road, Calcutta. For Japanese machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

# —REVIEW OF BOOKS

**HOW TO CHART TIME STUDY DATA by 'hil Carrol. Published by Mc Graw-Hill Book lompany, Inc. New York. Pages 322, price $ 5.0.**

The value of collecting and marshalling ime study data as handy tools towards achiev- ıg reduction of costs of production, improve- ıents in techniques of production, etc. has been ›ng understood in the industrial countries of ıe world. It has been found that investments ı time study incentive in manufacturing do ay in the long run and can help improving mployee satisfaction, production costs, deli- eries and profits, which make the essential ıements of success in competition.

To derive the best benefit from these data is usual to make charts and tables. The book nder review makes a systematic approach to ıe fundamentals and methods of charting time .udy data and attempts to explain the methods ' setting them up in various forms for the uick and correct solution of various problems of ısiness that arise during the daily course of ansactions.

The book urges the compilation and applica- on of standard data method in making time udy, as the recorded standards are said to ıve many advantages over those obtained by .rect time. Moreover these are said to be ıpersonal, more correct and ageless. The book so studies how the time study methods can ı improved and the forms of standard data .n be constructed to secure speed and accuracy. x commonly used forms of working data, e.g., ırve drawing, time equations, alignment ıarts, monograph, multi-variable charts, curve- mily—have been fully discussed in the book ith numerous graphs and worked out examples- etailed methods of their construction and plotting points have also been provided step step in the book. How these can be used analyse element data and to determine re- ιtionships between variables of time and mensional factors has been thoroughly dealt .th in the book. The reading of these curves .d converting them into tables also require re and in this respect also the book will make most helpful guide.

Each of the above six forms of data pre- ntation has both advantages and disadvan- ges inherent in it but the author's personal eference however happens to be the multi- riable form expressed in numbers. But at ı same time the author indicates that one thod in charting cannot be the best. Relative its are too important to be disregarded. nce choice of the form that most nearly fits ı specific conditions at the time of application ıl be necessary.

The book covers a wide range in time study .a and will be immensely helpful to all those o desire to make any use of time study data the general improvement of their processes ı business. In India this subject should

**ROLE OF PRIVATE ENTERPRISE IN INDIA—IN RETROSPECT AND PROSPECT. Published by the Secretary, Employers' Asso- ciation, 15, Park Street, Calcutta 16. Price Re. 1.**

The pamphlet under review traces out the changes that have occurred in the industrial structure of India during the last few years. It shows that in 20 years India has changed from a wholly agricultural economy to an agricultural cum industrial economy. The pamphlet dis- cusses the subject under the following heads : Growth of joint stock principle from 1900 on- wards, development and progress of industrial joint stock companies since 1930, volume of capital employed in Indian industries, avail- ability of capital development of credit institu- tions, installed capacity and production in various industries like textiles, steel, paper, sugar, cement, tea, etc., foreign capital in India, etc., etc. It will be seen from the survey that Indian enterprise is now broadening its base in several directions. The booklet makes inter- esting reading and the facts revealed by it should be taken into account in making any scheme for the industrial uplift of the country.

# NOTICES & REVIEWS

**(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this section.)**

**VERMILION**

We have the pleasure to receive a packet of "Satiprova Sindur" manufactured by Indian Ver- milion Manufacturing Co., 16/1, Nandalal Bose Lane, Calcutta 3. The preparation is found to be of superior quality.

**FOUNTAIN PEN INK**

We have received from Hindusthan Small Industries, 29, Manicktola Main Road, Calcutta, one phial of "Royal Blue" fountain pen ink, which is found to be good.

# TRADE ENQUIRIES

**(To communicate with any party write to him direct with name and address given below mentioning Industry.)**

1128 N. Patnaik, The Aryakala Nilay, Ku- huri, Puri—Wants to be put in touch with the suppliers of Gastans.

1130 Gupta Trading Co., Kanungoyan St., Meerut—Want to be put in touch with the dealers in water colour, chalk pencils, scales, scissors, razors, locks, small brass tickets for cows, dogs,

Edited, Printed & Published by K. N. Banerjee, for Industry Publishers Ltd., [illegible] 22 R. G. Kar Road, Calcutta - 4.